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QLogic 3000 and 3100 Series Intelligent Ethernet Adapters Users Guide

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Preface

Intended Audience

This guide is for system administrators and end-users of the QLogic 3000 and 3100 Series Intelligent Ethernet adapters.

Related Materials

- Release Notes included in the software release.
- Linux® man page % `man nx_nic`
- `nxudiag` utility help (diagnostics)
  - `nxudiag -h` or `nxudiag --help` (Windows®)
  - % `./nxudiag -h` or `nxudiag --help` (Linux)
- Check the QLogic Web site for updates.

Documentation Conventions

This guide uses the following documentation conventions:

- ***NOTE:*** provides additional information.
- Text in blue font indicates a hyperlink (jump) to a figure, table, or section in this guide, and links to Web sites are shown in underlined blue. For example:
  - Table 9-2 lists problems related to the installation.
  - See "Installation Checklist" on page 3-6.
  - For more information, visit www.qlogic.com.
- Text in **bold** font indicates user interface elements such as a menu items, buttons, check boxes, or column headings. For example:
  - Click **Start**, point to **Programs**, point to **Accessories**, and then click **Command Prompt**.
  - The Adapter Properties window opens with the **General** tab in front.

- Text in `Courier` font indicates a file name, directory path, command, or screen text. For example:
  - `nx3fwct.bin`
  - `C:\WINDOWS\system32\drivers`
- Text in **`Bold Courier`** font indicates a command to enter that performs a specific task. For example:
  - **`rpm -iv nx_nic-[version].src.rpm`**

  The italic text (***`version`***) indicates a variable.
- A percent sign (%) is the cursor prompt when executing Linux commands.
- The term <current release> refers to the current release of the software. For example, release 4.0.305. Check the Release Notes for the most up-to-date release version.
- Key names and key strokes are indicated with UPPERCASE:
  - Press CTRL+P.
  - Press the UP ARROW key.
- Text in *italics* indicates terms, emphasis, variables, or document titles. For example:
  - For a complete listing of license agreements, refer to the *QLogic Software End User License Agreement*.
  - What are *shortcut keys*?
  - `/lib/modules/<kernel-version>/kernel/net/netxen`

Technical Support

Customers should contact their authorized maintenance provider for technical support of their QLogic products. QLogic-direct customers may contact QLogic Technical Support; others will be redirected to their authorized maintenance provider.

Visit the QLogic support Web site listed in Contact Information for the latest firmware and software updates.

Availability

QLogic Technical Support for products under warranty is available during local standard working hours excluding QLogic Observed Holidays.

Training

QLogic offers training for technical professionals for all iSCSI, InfiniBand, Fibre Channel, and Intelligent Ethernet products. From the main QLogic Web page at www.qlogic.com, click the **Education and Resources** tab at the top, then click the **Education & Training** tab on the left. The QLogic Global Training Portal offers online courses, certification exams, and scheduling of in-person training.

Technical Certification courses include installation, maintenance and troubleshooting QLogic SAN products. Upon demonstrating knowledge using live equipment, QLogic awards a certificate identifying the student as a Certified Professional. The training professionals at QLogic may be reached by e-mail at training@qlogic.com.

Contact Information

Please feel free to contact your QLogic approved reseller or QLogic Technical Support at any phase of integration for assistance. QLogic Technical Support can be reached by the following methods:

Web	http://support.qlogic.com
Email	support@qlogic.com

The QLogic knowledge database contains troubleshooting information for the QLogic adapters. Access the data base from the QLogic Support Web page, http://support.qlogic.com. Use the Support Center search engine to look for specific troubleshooting information.

Notes

1 Overview

This guide describes the system requirements, installation, and setup required for the QLogic 3000 and 3100 Series Intelligent Ethernet adapters listed in Table 1-1.

This guide should be used in conjunction with the Release Notes.

Obtaining the Latest Software Release Information

Refer to the Release Notes for more information on the software release package contents.

The Release Notes document contains:

- Software release package contents
- Current driver and firmware release version
- Known issues
- Additional system software requirements

To download the latest version of the drivers and Release Notes for this product, refer to the QLogic Web site Downloads section: http://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/default.aspx.

Supported QLogic 3000 and 3100 Series Intelligent Ethernet Adapters

The products in Table 1-1 are supported in this document.

Table 1-1. QLogic 3000 and 3100 Series Intelligent Ethernet Adapters

Product	Product Definition	Transfer Medium
QLE3044	Quad-port 1GbE Intelligent Ethernet Adapter	Copper
QLE3142-CU	Dual-port 10GbE Intelligent Ethernet Adapter	Twinax
QLE3142-SR	Dual-port 10GbE Intelligent Ethernet Adapter (short range fiber)	Optical
QLE3142-LR	Dual-port 10GbE Intelligent Ethernet Adapter (long range fiber)	Optical

Table Notes

For OEM-branded QLogic 3000 and 3100 Series Intelligent Ethernet adapters, see the QLogic Web site.

These products are collectively referred to as the *QLogic adapter* unless otherwise noted.

The QLogic adapters are compatible with Windows®, Linux®, and other Operating Systems (OSes). For more information about supported operating systems, see the Release Notes.

Application Notes

For information about Linux PXE and iSCSI boot, see the following applications notes:

- *Setting up Linux PXE on Server and Client Systems*, part number FE0051401-00
- *iSCSI Boot Setup*, part number IS0051404-00

2 System Requirements

Before installing the QLogic adapter, make sure your system meets the requirements listed in this section:

- "Hardware Requirements" on page 2-1
- "System and Software Requirements" on page 2-2
- "Supported QLogic Adapters" on page 2-2

Hardware Requirements

Cable Specifications

Make sure the cables you are using meet the specifications listed in Tables 2-1 and 2-2.

Table 2-1. Cable Specifications — Optical

Product	Core Diameter (μm)	Optical Mode	Wavelength (nm)	Bandwidth (MHz)	Distance (m)
QLE3142-SR	50	OM2	850	400	66
				500	82
		OM3		2000	300
	62.5	OM1		160	26
				200	33
QLE3142-LR	9	n/a	1310	N/A	10,000
	10	n/a		N/A	10,000

Table 2-2. Cable Specifications — Copper

Product	Cable Type	Network Type	Cable Length (meters)
QLE3044-RJ	Cat5	LAN	100
QLE3142-CU	Copper direct attach twinax	LAN	10

SFP+ Optical Module Requirements

Use only the optical modules validated and shipped with the QLogic adapter.

System and Software Requirements

See the Release Notes for more information on the particular system and software requirements for the current software release. The drivers and Release Notes are on the QLogic Web site at:
to://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/default.aspx

Supported QLogic Adapters

Make sure you have one of the adapters listed in Table 1-1.

3 Installation Instructions

This section provides instructions for advanced users who are already familiar with hardware and software installation procedures. See the appropriate section, as applicable:

- “QLogic Adapter Installation and Verification” on page 3-1
- “Windows Server Driver Installation” on page 3-2
- “Linux Driver Installation” on page 3-4

QLogic Adapter Installation and Verification

The following sections provide high-level instructions for installing the QLogic adapter. For more detailed instructions, see “Hardware Installation” on page 4-1.

Pre-installation Checklist

Before installing the QLogic adapter:

1. Verify that the system meets the requirements specified in “System Requirements” on page 2-1 and in the Release Notes.
2. Power down the system.

QLogic Adapter Installation

To install the QLogic adapter:

1. Insert the QLogic adapter into an available PCI Express® slot.
2. Connect the appropriate cables to the QLogic adapter.
3. Power up the system.

Verify the QLogic Adapter Installation

To verify that the QLogic adapter has been installed correctly, perform the steps in the appropriate section.

Linux

On Linux systems, execute the following command:

```
# lspci -vvv -d 4040:
```

Windows Server

On Windows Server systems, perform the following steps:

1. Open the Start menu.
2. Highlight **My Computer**, then right-click the mouse button. On the shortcut menu, select **Manage**. The Computer Management window opens.
3. Select **Device Manager** under Computer Management.
4. Check under **Other devices** for an Unknown Device. The QLogic adapter will be listed as an Unknown Device. It will have a yellow question mark next to it prior to having the QLogic adapter driver installed.
5. Right-click the device and select **Properties** from the shortcut menu.
6. Click the **Details** tab. Look for `VEN_4040` as part of the string. This text indicates that the QLogic adapter is installed correctly.

Windows Server Driver Installation

Before installing the driver, download the driver package and the Release Notes from the QLogic Web site, www.qlogic.com.

See "Windows Server Driver Checklist" on page 5-1 for more information.

Windows Server 2003

To install the QLogic adapter driver:

1. Open the Start menu.
2. Highlight **My Computer**, then right-click the mouse button. On the shortcut menu, select **Manage**. The Computer Management window opens.
3. Select **Device Manager** under **Computer Management**.
4. Select **scan for new hardware changes**.
5. When prompted to connect to Windows Update, Click **No, not at this time**, and then click **Next**.
6. In the next window, click **Install from a list of specific location**, then click **Next**.
7. Select **Search for the best driver in these locations**. Deselect the **Search removable media** option. Select **Include this location in the search**.
8. Click **Browse**, then provide the path to the directory where the driver is located. The file name is either `nxnd5x86.sys` (Windows Server 2003, 32 bit) or `nxnd5x64.sys` (Windows Server 2003, 64 bit).

9. Locate the following files in the driver directory:

   `nx3fwct.bin`
   `nx3fwmn.bin`
   `nxnd5x86.sys` (Windows 2003, 32 bit) or
   `nxnd5x64.sys` (Windows 2003, 64 bit)

   Click **OK** in the Browse for Folder window.

10. Click the **Next** button from the Hardware Update Wizard window.

To configure the QLogic adapter:

1. On the Start menu, select **Control Panel**.
2. Select **Network Connections**.
3. Verify that Ethernet adapter icon says **Connected**.
4. Assign an IP address to the network interface.

Windows Server 2008

To install the QLogic adapter driver:

1. Open the Start menu.
2. Highlight **My Computer**, then right-click the mouse button. On the shortcut menu, select **Manage**. The Computer Management window opens.
3. Select **Device Manager** under **Computer Management**.
4. From the Device Manager window, select **scan for new hardware**. The Update Driver Software window opens.
5. Select **Browse my computer for driver software**, then click **Browse**.
6. Locate the following files in the driver directory:

   `nx3fwct.bin`
   `nx3fwmn.bin`
   `nxnd6x86.sys` (Windows Server 2008, 32 bit) or
   `nxnd6x64.sys` (Windows Server 2008, 64 bit)

   Click **OK** in the Browse for Folder window.

7. From the Update Driver Software window, click **Next**.

To configure the QLogic adapter:

1. On the Start menu, select **Control Panel**.
2. Select **Network Connections**.
3. Verify that Ethernet adapter icon says **Connected**.
4. Assign an IP address to the network interface.

Linux Driver Installation

Before installing the driver, download the driver package and the Release Notes from the QLogic Web site, www.qlogic.com.

See "Linux Driver Checklist" on page 6-1 for more information.

Verify and Remove Existing QLogic Adapter Driver and Tools Package

If you have a previous version of the QLogic adapter driver, perform the following steps to remove the driver and tools package:

1. Type:

   rpm -qa | grep nx_

2. Type:

   ifconfig eth[*n*] down

3. Type:

   rmmod nx_nic.ko

4. Type:

   rpm -e nx_nic-[*version*]

5. Type:

   rpm -e nx_tools-[*version*]

Install the Driver (RPM)

Red Hat®

To install the driver on a Red Hat system:

1. Type the following command to install the RPM source:

   rpm -iv nx_nic-[*version*].src.rpm

2. Type the following command to build the binary RPM:

   rpmbuild -bb /usr/src/redhat/SPECS/nx_nic-[*version*].spec

3. Type the following command to install the binary RPM:

   rpm -ivh /usr/src/redhat/RPMS/[*arch*]/nx_nic-[*version*].[*arch*].rpm

   The *[arch]* variable designates the system architecture. Some *[arch]* variables are i386, i586, i686, x86_64, depending on the system.

4. Type the following command to install the tools RPM:

   rpm -ivh nx_tools-[*version*].rpm

5. Type the following command to load the driver:

   modprobe -v nx_nic

SUSE®

To install the driver on a SUSE system:

1. Type the following command to install the RPM source:

   rpm -iv nx_nic-[*version*].src.rpm

2. Type the following command to build the binary RPM:

   rpmbuild -bb /usr/src/packages/SPECS/nx_nic-[*version*].spec

3. Type the following command to install the binary RPM:

   rpm -ivh /usr/src/packages/RPMS/[*arch*]2/nx_nic-[*version*].[*arch*].rpm

   The *[arch]* variable designates the system architecture. Some *[arch]* variables are i386, i586, i686, x86_64, depending on the system.

4. Type the following command to install the tools RPM:

   rpm -ivh nx_tools-[*version*].rpm

5. Type the following command to load the driver:

   ```
   modprobe firmware_class
   modprobe -v nx_nic
   ```

QLogic Adapter Configuration

To configure the QLogic adapter:

1. Type the following command to identify the Ethernet interface:

   cat /proc/net/nx_nic/dev0/stats

2. Type the following command to assign an IP address:

   ifconfig eth[*n*] [*ip address*]

Notes

4 Hardware Installation

This section provides installation instructions for the QLogic adapters. Please follow all applicable ESD precautions when handling the QLogic adapter.

QLE3044 Installation

To install the QLE3044:

1. Verify that the system is powered off and unplug the power cord.
2. Remove the system cover.
3. Locate an empty x4 or higher PCIe® slot.
4. Insert the QLE3044 into the PCIe slot. Apply uniform pressure on top of the QLE3044 until it is firmly seated in the PCIe bus connector.
5. Secure the bracket to the chassis and replace the cover.
6. Connect the appropriate cables to the QLE3044.
7. Plug in the power cord and power up the system.

The QLE3044 contains four ports that are organized as shown in Figure 4-1. Note that the portion of the bracket covering the four RJ45 jacks is not shown.

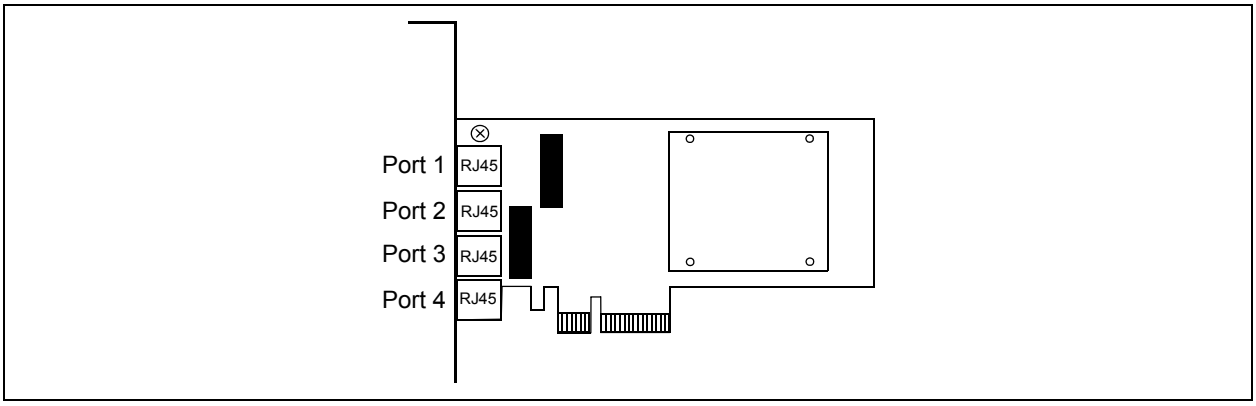


Figure 4-1. QLE3044 Port Assignments

Ethernet Port Mapping

The mapping of port numbers on the QLE3044 is shown in Table 4-1.

Table 4-1. Mapping of Port Number, PCI Function, and Ethernet Interface

Port Number	PCI Function	Ethernet Interface
1	0	Ethernet interface numbers are dynamically allocated by the host. As such, any eth[*n*] interface can be connected to any port.
2	1	
3	2	
4	3	

QLE3044 Status LEDs

The QLE3044 has two status LEDs per port. These LEDs are located on the actual port itself as shown in Figure 4-2. When viewing the QLE3044 from the front, the bi-color green/orange link LED is on the left, and the green activity LED is on the right.

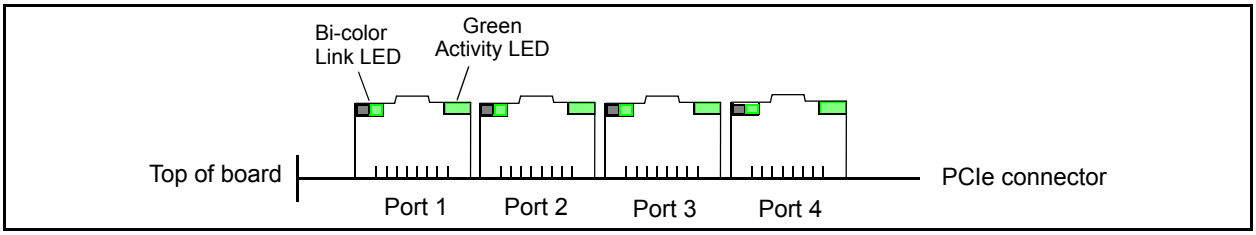


Figure 4-2. QLE3044 Status LEDs — Front View

The bi-color link LED indicates the speed of the connection as shown in Table 4-2.

Table 4-2. QLE3044 LED Definitions

Speed	Green/Orange Bi-color Link LED	Green Activity LED
10 Mbps	Off	During power-up, the activity LED is on continuously (solid). The LED blinks during normal operation when there is activity on the port for any of the speed settings.
100 Mbps	Green On	
1000 Mbps	Orange On	

QLE3044 Bracket Removal and Replacement

Depending on the type of system, installation of the QLE3044 requires either a long bracket or a short bracket. QLogic provides both of these brackets with the product. The brackets for the QLE3044 are different from previous brackets in that they slide over the top of the four RJ45 Ethernet jacks.

To remove and replace the bracket:

1. Remove the screw at the top of the QLE3044 that holds the bracket in place.
2. The bracket covers the top of the RJ45 Ethernet jacks. Slide the bracket upward towards the top of the QLE3044 until it clears all of the Ethernet jacks.
3. To replace with a different bracket, reverse the process, sliding the new bracket over the Ethernet jacks. Then fasten in place with the screw.

The removal and replacement process is illustrated in Figure 4-3 and Figure 4-4, respectively.

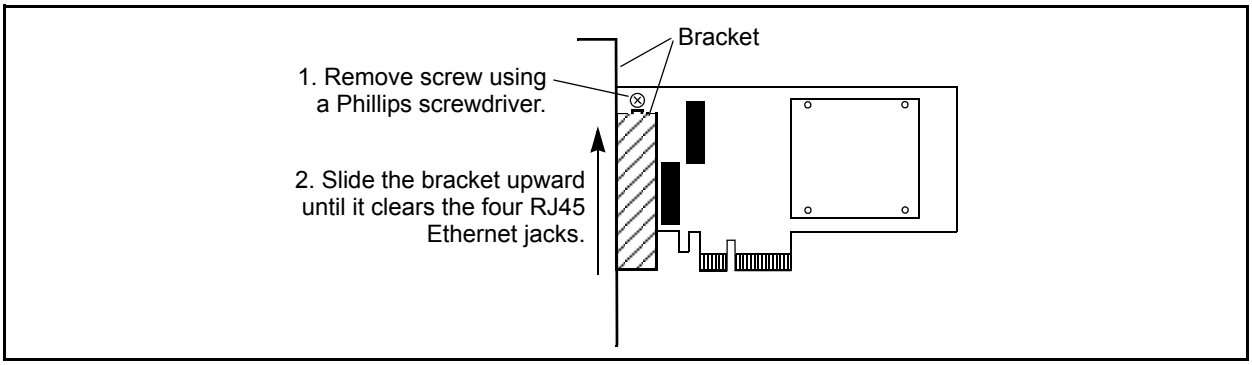

Bracket
1. Remove screw using a Phillips screwdriver.
2. Slide the bracket upward until it clears the four RJ45 Ethernet jacks.

Figure 4-3. QLE3044 Bracket Removal

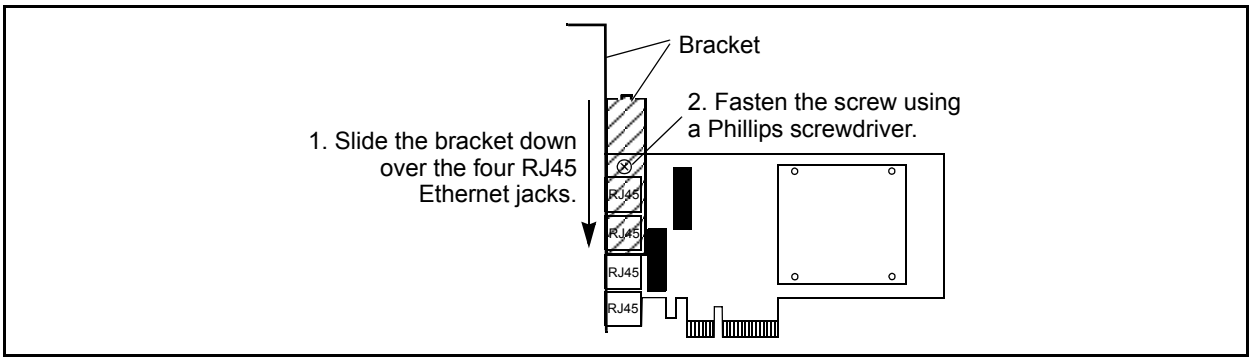


Figure 4-4. QLE3044 Bracket Replacement

QLE3142 Installation

To install the QLE3142:

1. Verify that the system is powered down and unplug the power cord.
2. Remove the system cover.
3. Locate an empty x8 PCIe slot.
4. Remove the SFP+ optical modules from the QLE3142 if they are already inserted (see Figure 4-5).
5. Insert the QLE3142 into the x8 PCIe slot. Apply uniform pressure on top of the QLE3142 until it is firmly seated in the bus connector.
6. Connect the SFP+ module or copper direct attach twinax cable. Listen for an audible clicking sound when the optical module is inserted into the housing (see Figure 4-5).
7. Secure the bracket to the chassis and replace the cover.
8. Connect the appropriate cables to the QLE3142.
9. Plug in the power cord and power up the system.

NOTE:

The optical module must be seated correctly in the housing to ensure proper operation.

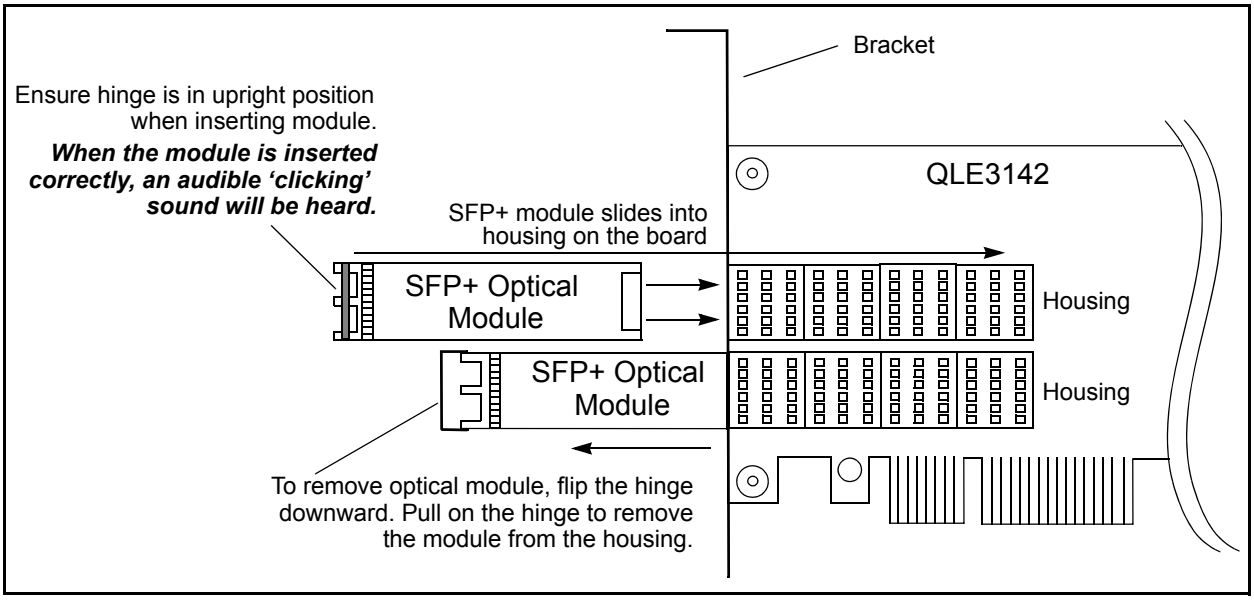

Bracket
Ensure hinge is in upright position when inserting module.
When the module is inserted correctly, an audible 'clicking' sound will be heard.
QLE3142
SFP+ module slides into housing on the board
SFP+ Optical Module
Housing
SFP+ Optical Module
Housing
To remove optical module, flip the hinge downward. Pull on the hinge to remove the module from the housing.

Figure 4-5. QLE3142 Installation and Removal

QLE3142 Status LEDs

The QLE3142 has two status LEDs per port, one for link status and one for activity. These LEDs are located next to the ports as shown in Figure 4-6. Both SFP+ ports operate at 10Gbps.

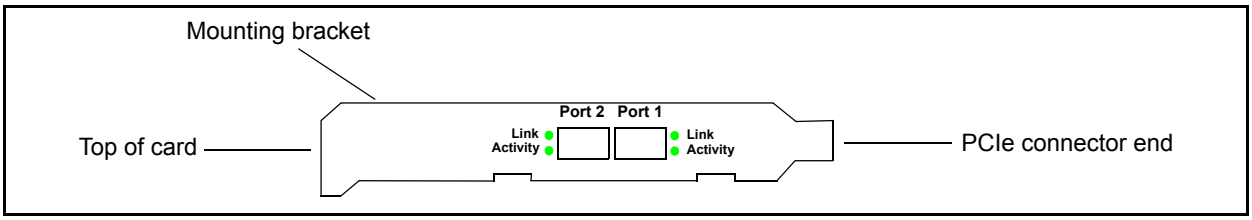


Figure 4-6. QLE3142 Status LEDs — Side View

QLE3142 Bracket Removal and Replacement

Depending on the type of system, installation of the QLE3142 requires either a long bracket or a short bracket. QLogic provides both of these brackets with the product.

To remove and replace the bracket:

1. Remove the SFP+ optical modules from their housing (see Figure 4-7).
2. Remove the two screws at the top and bottom of the QLE3142 that hold the bracket in place.

3. Gently pull the bracket away from the QLE3142 until it disconnects from the optical module housings.
4. To replace with a different bracket, reverse the process, sliding the new bracket over the module housings (see Figure 4-8). Note that the screw mounting tabs on the bracket go on the solder side of the QLE3142. Fasten the bracket in place with the two screws.

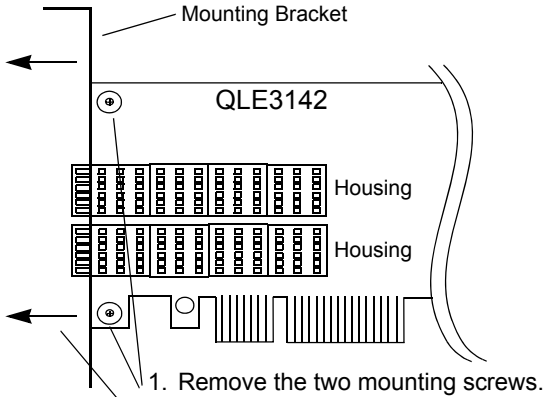

Mounting Bracket
QLE3142
Housing
Housing
1. Remove the two mounting screws.
2. Gently pull the bracket away from the board until it clears the optical module housings.

Figure 4-7. QLE3142 Bracket Removal

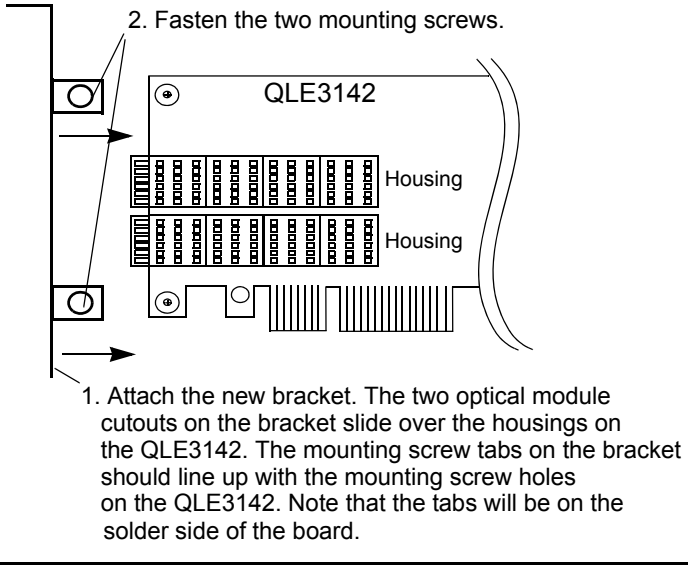

2. Fasten the two mounting screws.
QLE3142
Housing
Housing
1. Attach the new bracket. The two optical module cutouts on the bracket slide over the housings on the QLE3142. The mounting screw tabs on the bracket should line up with the mounting screw holes on the QLE3142. Note that the tabs will be on the solder side of the board.

Figure 4-8. QLE3142 Bracket Replacement

5 Windows Server 2003 and 2008 Driver Installation and Configuration

This section describes the installation and configuration procedure for Windows Server 2003 and 2008 operating systems (OSes), collectively referred to as *Windows Server* unless otherwise noted. For Linux driver installation instructions, see Section 6. Throughout this section, some screen shots show both the Windows Server 2003 and the Windows Server 2008 versions.

Windows Server Driver Checklist

Here is a brief summary of Windows installation guidelines with which you should be familiar before installing the QLogic adapter driver on a Windows Server OS.

- Windows Server Service Pack (SP) requirements
- Location of auto-load firmware files
- System requirements (see the Release Notes)

Each of these guidelines is described in more detail in the following sections.

See “Uninstall the QLogic Adapter Driver in Windows Server” on page 5-23 for the location of the driver and firmware files (after the driver plug-ins are installed).

Windows Server Service Pack Requirements

SP2 must be installed for the Windows 2003 OS fixes.

Firmware ROM Image Location

The firmware ROM image files (`nx3fwct.bin` and `nx3fwmn.bin`) are placed in the `C:\WINDOWS\system32\drivers` directory.

QLogic provides both a GUI and command line interface (CLI) for communicating with the Flash utility.

Windows Server Driver Installation and Verification

Note that the following procedure is for a new driver installation.

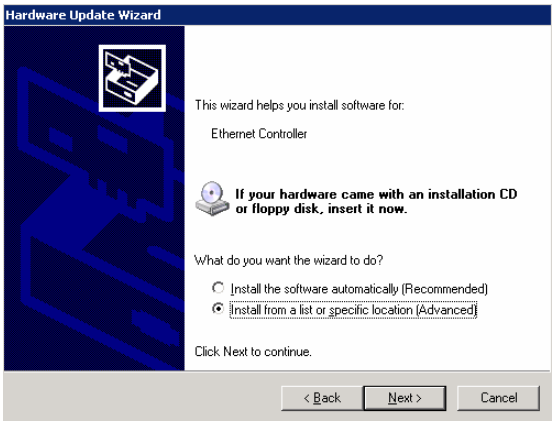
1. Copy the QLogic adapter release package to a directory on the host.
2. After the server system is powered up, Windows detects the QLogic adapter, and the Found New Hardware Wizard dialog box opens (Figure 5-1).

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
Windows will search for current and updated software by looking on your computer, on the hardware installation CD, or on the Windows Update Web site (with your permission).
Online privacy information
Can Windows connect to Windows Update to search for software?
Yes, this time only
Yes, now and every time I connect a device
No, not this time
Click Next to continue.
< Back
Next >
Cancel

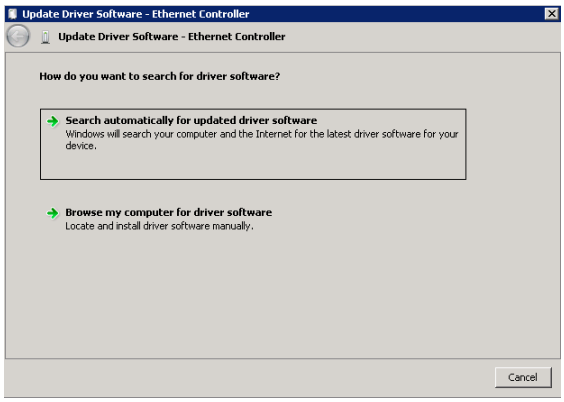
Figure 5-1. Found New Hardware Wizard Dialog Box

Select **No, not at this time**, and then click **Next**. The wizard opens another dialog box prompting for driver location information.

3. Do one of the following:
   - Windows Server 2003: select **Install from a list or specific location (Advanced)**, and then click the **Next** button (Figure 5-2).
   - Windows Server 2008: select **Browse my computer for driver software** (Figure 5-2).


Hardware Update Wizard
This wizard helps you install software for:
Ethernet Controller
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

Windows Server 2003


Update Driver Software - Ethernet Controller
Update Driver Software - Ethernet Controller
How do you want to search for driver software?
Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device.
Browse my computer for driver software
Locate and install driver software manually.
Cancel

Windows Server 2008

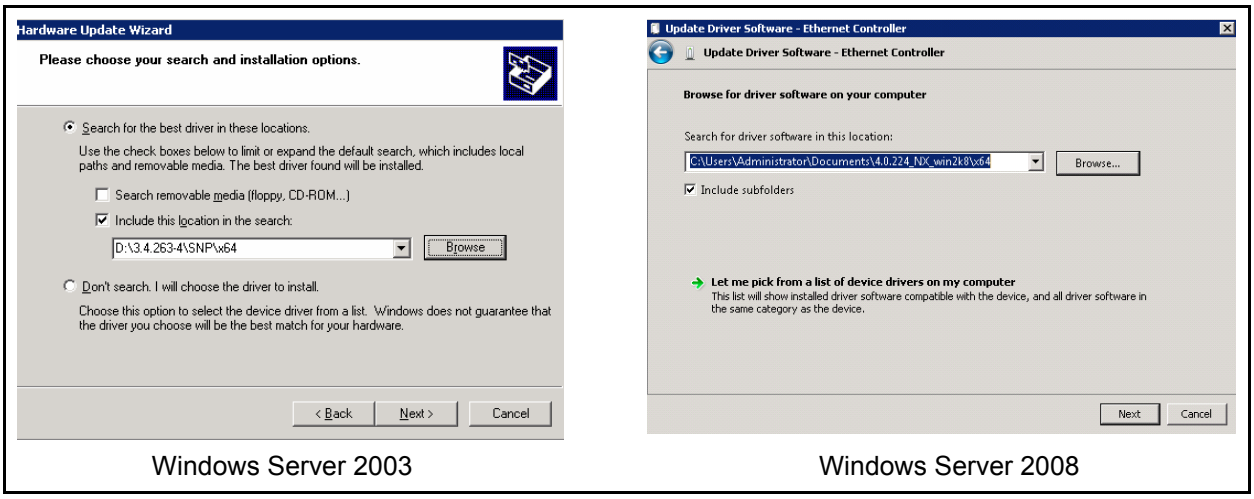
Figure 5-2. Driver Location Information

A dialog box opens prompting for more information about the driver location.

4. Do one of the following:

   - Windows Server 2003: select **Search for the best driver in these locations**, and then select **Include this location in the search** (Figure 5-3).
   - Windows Server 2008: in the Update Driver Software dialog box, select **Browse for driver software on your computer**.

     Type the appropriate path to the QLogic adapter driver directory in the accompanying field, then click the **Next** button (Figure 5-3).

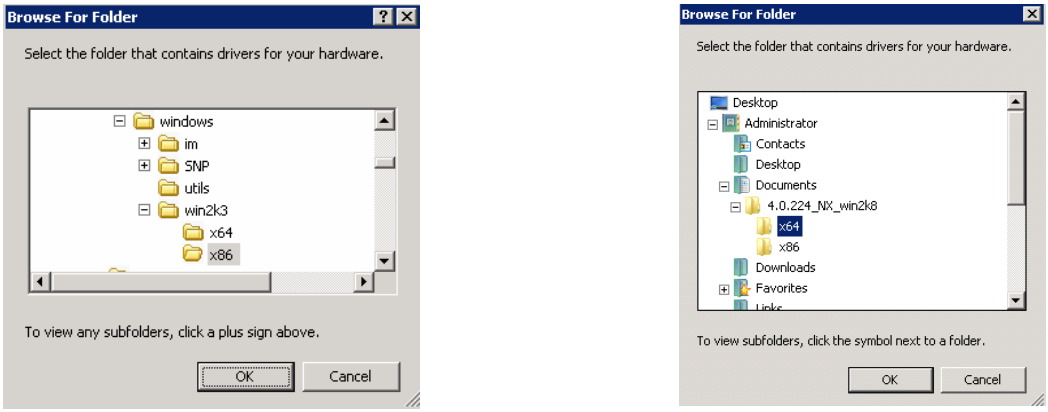

Hardware Update Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
D:\3.4.263-4\SNP\x64
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel
Update Driver Software - Ethernet Controller
Update Driver Software - Ethernet Controller
Browse for driver software on your computer
Search for driver software in this location:
C:\Users\Administrator\Documents\4.0.224_NIC_win2k8\x64
Browse...
Include subfolders
Let me pick from a list of device drivers on my computer
This list will show installed driver software compatible with the device, and all driver software in the same category as the device.
Next
Cancel

Windows Server 2003 Windows Server 2008

Figure 5-3. Select Driver Location

If you do not know the exact directory path, click **Browse**, and then select the QLogic adapter driver directory.

Select the appropriate directory (x86 or x64), and then click the **OK** button (Figure 5-4). The QLogic adapter supports both 32-bit and 64-bit OSes (see the Release Notes for more information). The x86 directory contains the 32-bit driver. The x64 directory contains the 64-bit driver.



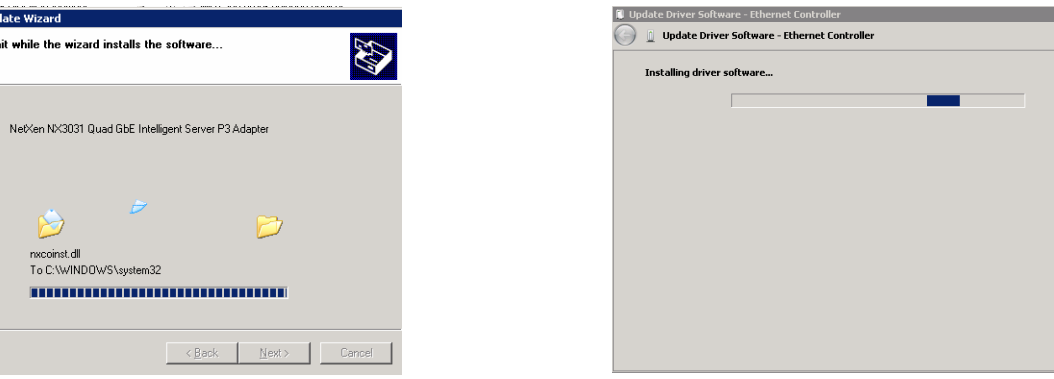
Windows Server 2003 Windows Server 2008

Figure 5-4. Browse for Folder

5. Do one of the following:

   - Windows Server 2003: click **Next** in the Hardware Update Wizard dialog box to install the driver.
   - Windows Server 2008: click **Next** in the Update Driver Software dialog box to install the driver.

   The Please wait while the wizard installs the software dialog box is displayed while the driver is being installed (Figure 5-5).


Hardware Update Wizard
Please wait while the wizard installs the software...
NetXen NX3031 Quad GbE Intelligent Server P3 Adapter
nxcoinst.dll
To C:\WINDOWS\system32
< Back
Next >
Cancel
Update Driver Software - Ethernet Controller
Update Driver Software - Ethernet Controller
Installing driver software...

Windows 2003 Windows 2008

Figure 5-5. Software Installation Progress

6. Click the **Finish** button on the final dialog box (Figure 5-6).

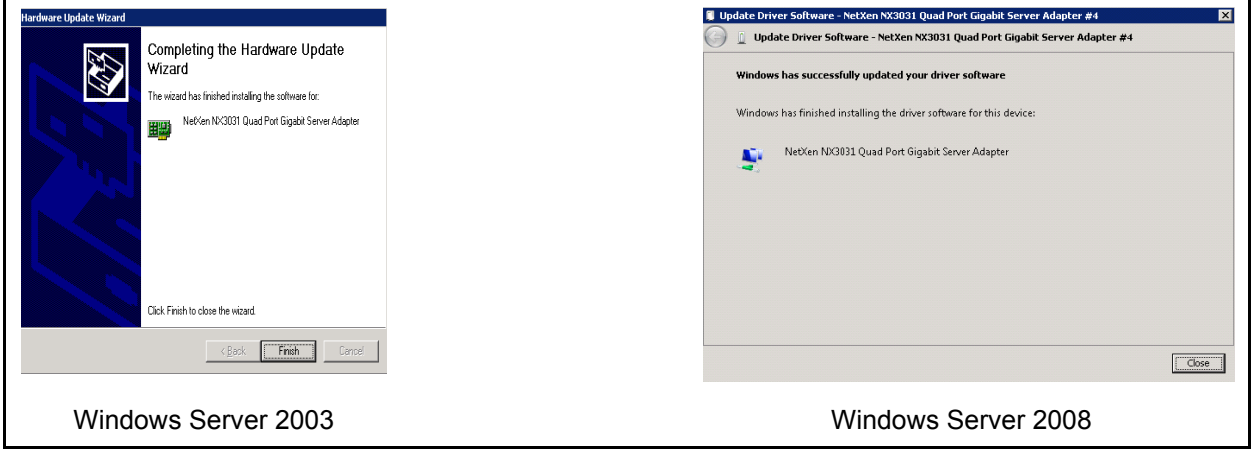

Hardware Update Wizard
Completing the Hardware Update Wizard
The wizard has finished installing the software for:
NetXen NX3031 Quad Port Gigabit Server Adapter
Click Finish to close the wizard.
< Back
Finish
Cancel
Update Driver Software - NetXen NX3031 Quad Port Gigabit Server Adapter #4
Update Driver Software - NetXen NX3031 Quad Port Gigabit Server Adapter #4
Windows has successfully updated your driver software
Windows has finished installing the driver software for this device:
NetXen NX3031 Quad Port Gigabit Server Adapter
Close
Windows Server 2003
Windows Server 2008

Figure 5-6. Software Installation Complete

To verify that the driver was properly installed:

1. On the **Start** menu, right-click **My Computer**, and then select **Device Manager**. A list of devices appears in right side of the window.
2. Verify that the QLogic adapter is listed under Network Adapters, as shown in Figure 5-7.

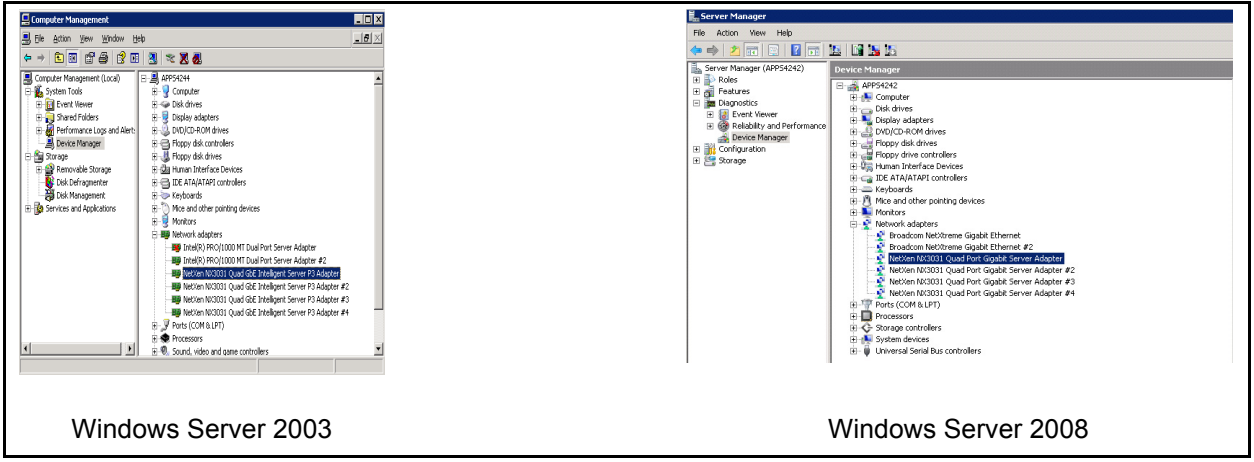


Figure 5-7. Driver Installation Verification

Windows Server Driver Configuration

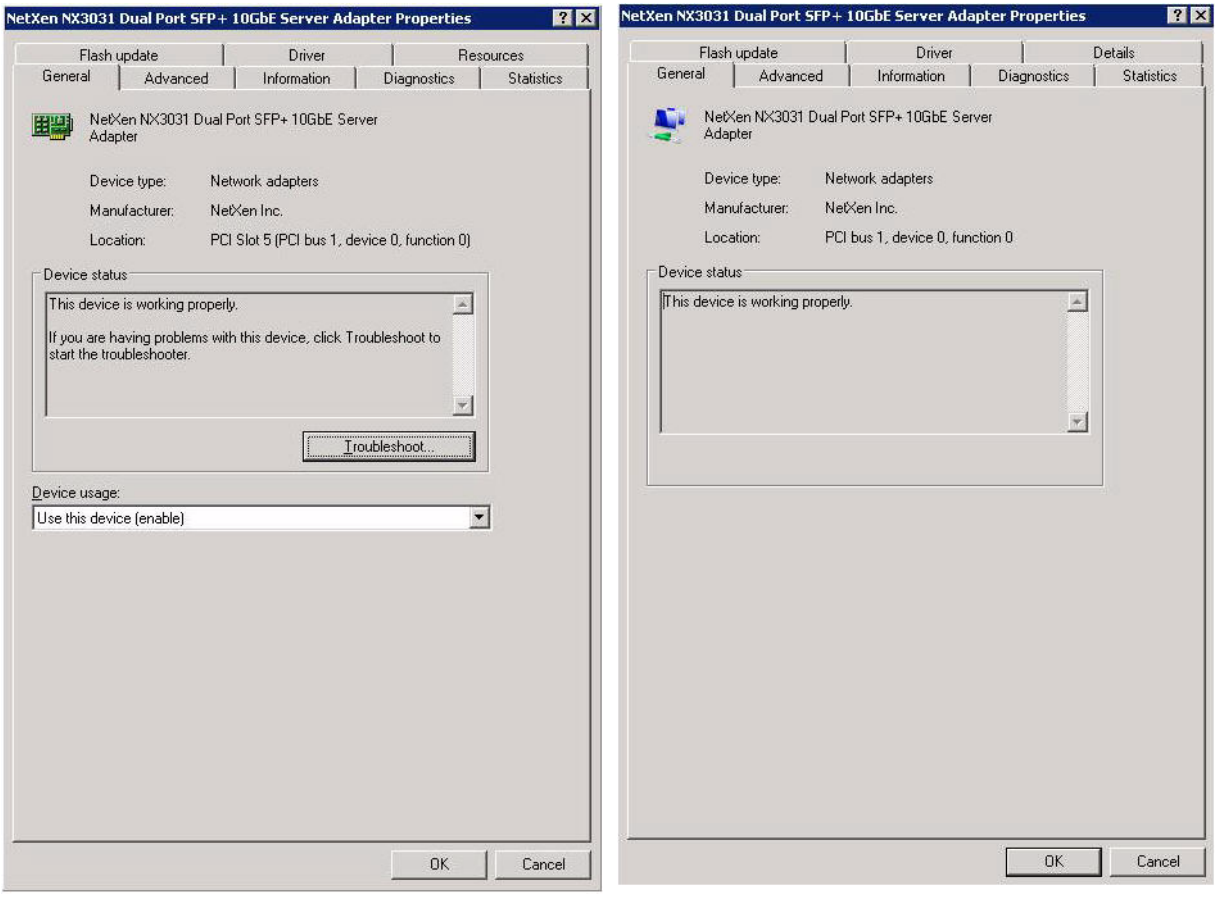
The QLogic adapter driver can be configured through the adapter properties in Device Manager.

To access the Device Manager:

1. On the **Start** menu, right-click **My Computer**, and then select **Device Manager**. A list of devices appears in right side of the window.
2. Under Network Adapters, right-click the QLogic adapter (see Figure 5-7), and then select **Properties**.

General Tab

The adapter properties window opens with the **General** tab in front (Figure 5-8).

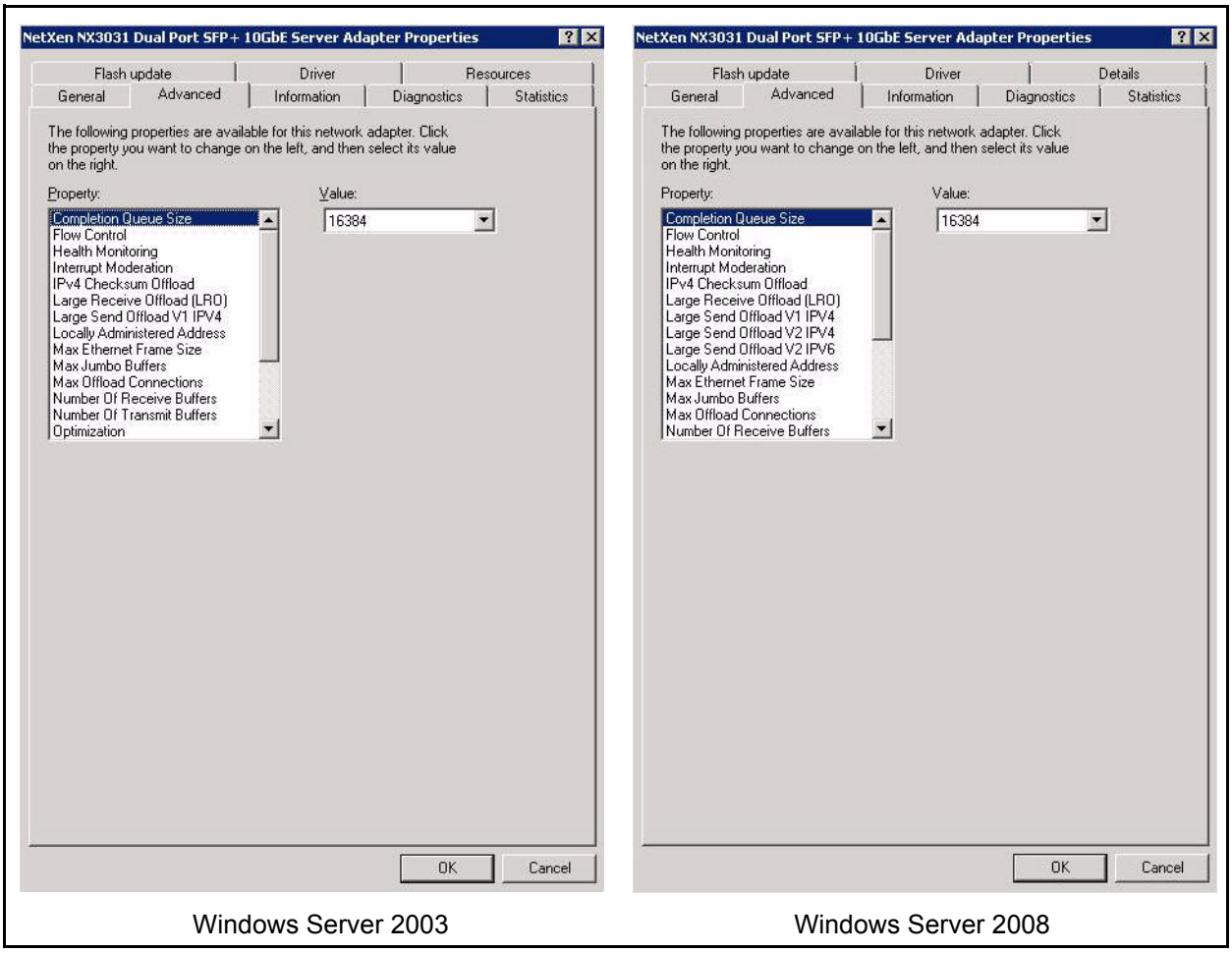


Windows Server 2003 Windows Server 2008

Figure 5-8. Adapter Properties — General Tab

Advanced Tab

Click the **Advanced** tab to display the driver properties (Figure 5-9).



Windows Server 2003 Windows Server 2008

Figure 5-9. Adapter Properties — Advanced Tab

Table 5-1 describes the **Advanced** tab selections.

Table 5-1. Advanced Properties Parameters

Parameter	Description
Completion Queue Size	This parameter indicates the size of the completion queue. ■ Registry Key: CompletionQueueSize ■ Default: 4 (16,384 entries). ■ Values (entries): 0 (1024), 1 (2048), 2 (4096), 3 (8192), 4 (16,384), 5 (32,768)
Flow Control	This parameter sets flow control parameters. There are four flow control options: 0 (off), 1 (transmit), 2 (receive), and 3 (transmit/receive). ■ Registry Key: FlowControl ■ Default: 3 (Transmit and receive flow control enabled). ■ Values: 0, 1, 2, 3
Health Monitoring	This parameter maintains the health of the device. Disabling this parameter should performed under advisement from QLogic. ■ Registry Key: Watchdog ■ Default: Health monitoring enabled. ■ Values: Enabled/Disabled
Interrupt Moderation	This parameter provides interrupt moderation. When this parameter is enabled, interrupts are moderated automatically based on traffic patterns. ■ Registry Key: InterruptModeration ■ Default: Disabled ■ Values: Enabled/Disabled
IPv4 Checksum Offload	This parameter enables/disables the IPv4 checksum offload. There are four flow checksum options: 0 (off), 1 (transmit), 2 (receive), and 3 (transmit/receive). ■ Registry Key: IPChecksumOffloadv4 ■ Default: 3 (Transmit and receive checksum enabled) ■ Values: 0, 1, 2, 3

Table 5-1. Advanced Properties Parameters (Continued)

Parameter	Description
Large Receive Offload (LRO)	This parameter specifies the large receive offload — enable/disable options. ■ Registry Key: LRO ■ Default: Enabled ■ Values: Enabled/Disabled
Large Send Offload V1 IPv4	This parameter specifies the large send offload — enable/disable options. ■ Registry Key: LsoV1IPv4 ■ Default: Enabled ■ Values: Enabled/Disabled ■ Size of LSO: 64K maximum
Large Send Offload V2 IPv4 [a]	This parameter specifies the large send offload — enable/disable options. ■ Registry Key: LsoV2IPv4 ■ Default: Enabled ■ Values: Enabled/Disabled ■ Size of LSO: 64K maximum
Large Send Offload V2 IPv6 [a]	This parameter specifies the large send offload — enable/disable options. ■ Registry Key: LsoV2IPv6 ■ Default: Enabled ■ Values: Enabled/Disabled ■ Size of LSO: 64K maximum
Locally Administered Address	This is the locally administered address (LAA) that users/administrators can set on this interface to override the permanent address of the QLogic adapter (that may have been flashed into the hardware). ■ Registry Key: NetworkAddress ■ Format: Hex ■ Options: Value. (A value is required — enter the 12 hex bytes of the MAC address to be used, or not present.)

Table 5-1. Advanced Properties Parameters (Continued)

Parameter	Description
Max Ethernet Frame Size	This parameter specifies the Ethernet frame size for packet transmission and receive (it does not include the MAC header). ■ Reg Key: MaxFrameSize ■ Default: 1500 (corresponds to 1514 bytes on the wire + 4 bytes of CRC) ■ Max: 9000 ■ Min: 64 ■ Step: 1
Max Jumbo Buffers	This parameter specifies the maximum number of receive buffers per Jumbo frame. ■ Reg Key: RxJumboRingSize ■ Default: 2 (4096 buffers) ■ Values: 0 (1024), 1 (2048), 2 (4096), 3 (8192)
Max Offload Connections	This parameter specifies the maximum number of offload connections. ■ Reg Key: MaxOffloadConnections ■ Default: 512 ■ Max: 512 ■ Min: 0 ■ Step: 1 ***NOTE:*** this feature is not supported at the time of publication.
Number of Receive Buffers	This parameter specifies the packet buffers used by the driver for receive operations (DMA memory and indicated to stack). Each buffer is 1536 bytes. ■ Registry Key: ReceiveBuffers ■ Default: 4 (16,384 entries) ■ Values (entries): 0 (1024), 1 (2048), 2 (4096), 3 (8192), 4 (16,384), 5 (32,768)

Table 5-1. Advanced Properties Parameters (Continued)

Parameter	Description
Number of Transmit Buffers	This parameter specifies the packet buffers used by the driver for transmit operations (DMA memory and indicated to stack). Each buffer is 1536 bytes. ■ Registry Key: TransmitBuffers ■ Min: 1K ■ Max: 2K ■ Default: 1024 ■ Values: 0 (1024), 1 (2048)
Optimization	This parameter controls optimization and IP forwarding. Enable this function when the QLogic adapter is used for IP forwarding. ■ Registry Key: Optimization ■ Default: Disabled ■ Values: Disabled/Enabled
Priority and VLAN Tag	This parameter controls support for 802.1p/q priority tagging. Enable this parameter to set the VLAN ID. There are four options. 0: Both 802.1p/q priority tagging and VLAN tagging disabled. 1: Priority tagging enabled, VLAN tagging disabled. 2: VLAN tagging enabled, priority tagging disabled. 3: Both 802.1p/q priority tagging and VLAN tagging enabled. ■ Registry Key: PriorityVLANTag ■ Default: 3 ■ Values: 0, 1, 2, 3
Receive Side Scaling	This parameter enables/disables the receive side scaling (RSS) feature. ■ Registry Key: RSS ■ Default: Enabled ■ Values: Enabled/Disabled

Table 5-1. Advanced Properties Parameters (Continued)

Parameter	Description
Receive Side Scaling Rings	This parameter controls the number of rings used. The total is calculated by 1KB $\times 2^n$ with a value of 5 for a maximum of 32KB. ■ Registry Key: MaxStatusRings ■ Default: 2 ■ Max: 4 ■ Min: 1 ■ Step: 1
TCP Checksum Offload IPv4	This parameter enables/disables the TCP checksum offload for IPv4. There are four TCP checksum options: 0 (off), 1 (transmit), 2 (receive), and 3 (transmit/receive). ■ Registry Key: TCPChecksumOffloadv4 ■ Default: 3 (Transmit and receive checksum enabled) ■ Values: 0, 1, 2, 3
TCP Checksum Offload IPv6 [a]	This parameter enables/disables the TCP checksum offload for IPv6. There are four TCP checksum options: off (0), transmit (1), receive (2), and transmit/receive (3). ■ Registry Key: TCPChecksumOffloadv6 ■ Default: 3 (Transmit and receive checksum enabled) ■ Values: 0, 1, 2, 3
UDP Checksum Offload IPv4	This parameter enables/disables the UDP checksum offload. There are four UDP checksum options: 0 (off), 1 (transmit), 2 (receive), and 3 (transmit/receive). ■ Registry Key: UDPChecksumOffloadv4 ■ Default: 3 (Transmit and receive checksum enabled) ■ Values: 0, 1, 2, 3

Table 5-1. Advanced Properties Parameters (Continued)

Parameter	Description
UDP Checksum Offload IPv6 [a]	This parameter enables/disables the UDP checksum offload. There are four UDP checksum options: 0 (off), 1 (transmit), 2 (receive), and 3 (transmit/receive). ■ Registry Key: UDPChecksumOffloadv6 ■ Default: 3 (Transmit and receive checksum enabled) ■ Values: 0, 1, 2, 3
VLAN ID	This parameter sets the VLAN ID for this interface (also exposed through the standard OID). ■ Registry Key: VlanId ■ Default: 0 (no VLAN) ■ Max: 4094 ■ Min: 0 ■ Step: 1 ■ Range: 0–4094

Table Notes

[a] Windows Server 2008 only

Information Tab

Click the **Information** tab for information about the firmware version, BIOS version, driver version, and other QLogic adapter properties (Figure 5-10).

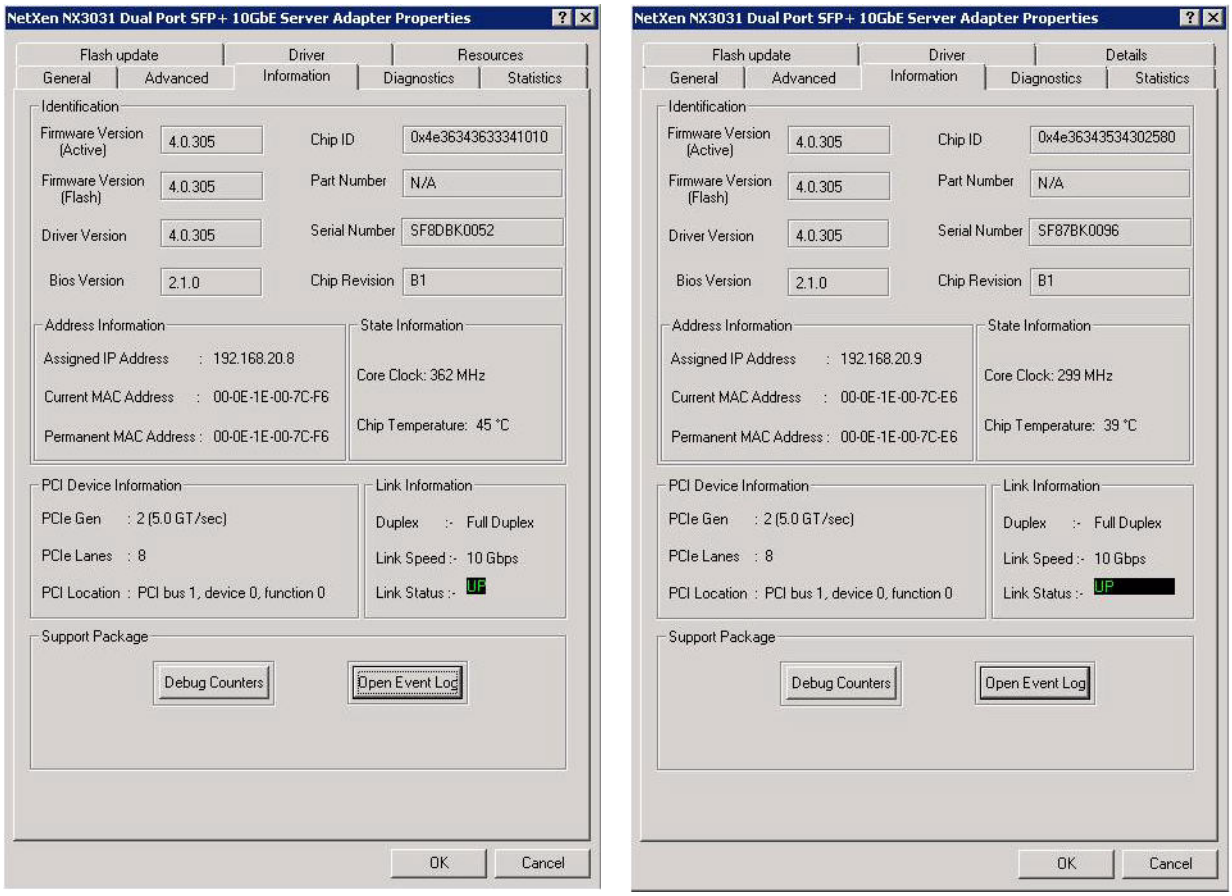
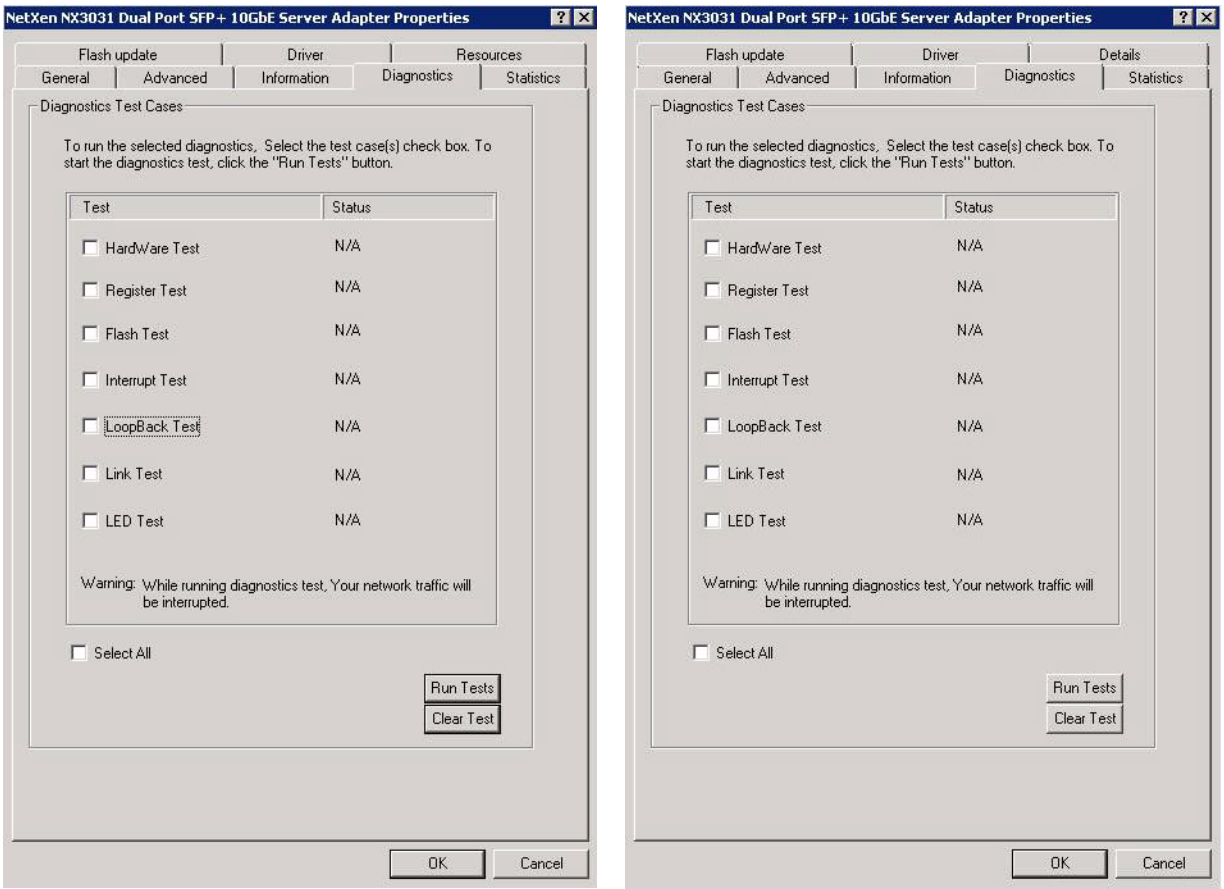


Figure 5-10. Adapter Properties — Information Tab

Diagnostics Tab

Click the **Diagnostics** tab to test the QLogic adapter's Flash, LED, and other functions (Figure 5-11).



Windows Server 2003 Windows Server 2008

Figure 5-11. Adapter Properties — Diagnostics Tab

Statistics Tab

Click the **Statistics** tab to view information about the QLogic adapter (Figure 5-12).

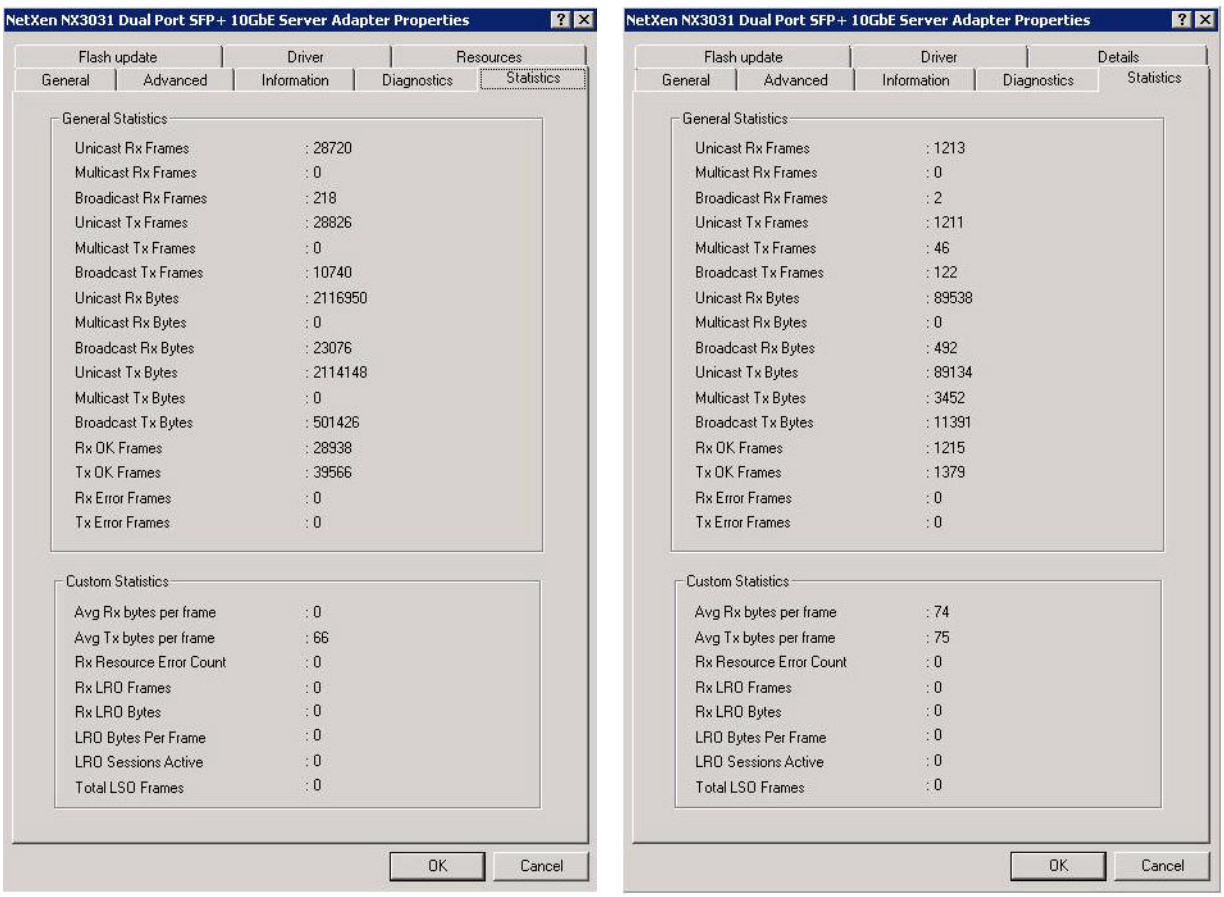
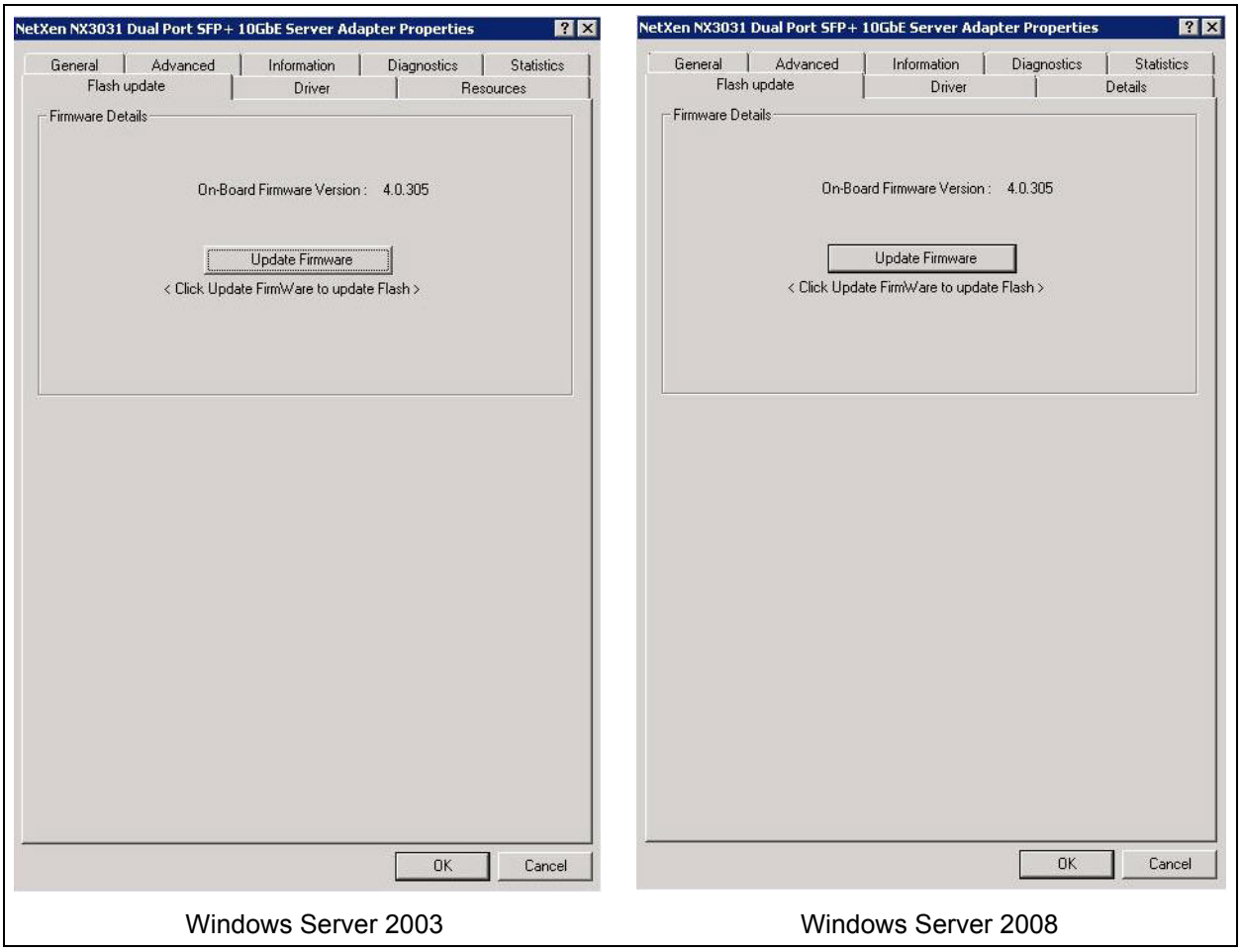

NetXen NX3031 Dual Port SFP+ 10GbE Server Adapter Properties
Flash update
Driver
Resources
General
Advanced
Information
Diagnostics
Statistics
General Statistics
Unicast Rx Frames : 28720
Multicast Rx Frames : 0
Broadcast Rx Frames : 218
Unicast Tx Frames : 28826
Multicast Tx Frames : 0
Broadcast Tx Frames : 10740
Unicast Rx Bytes : 2116950
Multicast Rx Bytes : 0
Broadcast Rx Bytes : 23076
Unicast Tx Bytes : 2114148
Multicast Tx Bytes : 0
Broadcast Tx Bytes : 501426
Rx OK Frames : 28938
Tx OK Frames : 39566
Rx Error Frames : 0
Tx Error Frames : 0
Custom Statistics
Avg Rx bytes per frame : 0
Avg Tx bytes per frame : 66
Rx Resource Error Count : 0
Rx LRO Frames : 0
Rx LRO Bytes : 0
LRO Bytes Per Frame : 0
LRO Sessions Active : 0
Total LSO Frames : 0
OK
Cancel
Windows Server 2003
NetXen NX3031 Dual Port SFP+ 10GbE Server Adapter Properties
Flash update
Driver
Details
General
Advanced
Information
Diagnostics
Statistics
General Statistics
Unicast Rx Frames : 1213
Multicast Rx Frames : 0
Broadcast Rx Frames : 2
Unicast Tx Frames : 1211
Multicast Tx Frames : 46
Broadcast Tx Frames : 122
Unicast Rx Bytes : 89538
Multicast Rx Bytes : 0
Broadcast Rx Bytes : 492
Unicast Tx Bytes : 89134
Multicast Tx Bytes : 3452
Broadcast Tx Bytes : 11391
Rx OK Frames : 1215
Tx OK Frames : 1379
Rx Error Frames : 0
Tx Error Frames : 0
Custom Statistics
Avg Rx bytes per frame : 74
Avg Tx bytes per frame : 75
Rx Resource Error Count : 0
Rx LRO Frames : 0
Rx LRO Bytes : 0
LRO Bytes Per Frame : 0
LRO Sessions Active : 0
Total LSO Frames : 0
OK
Cancel
Windows Server 2008

Figure 5-12. Adapter Properties — Statistics Tab

Flash Update Tab

Click the **Flash update** tab to view the current firmware version on the QLogic adapter and update the firmware if required (Figure 5-13).

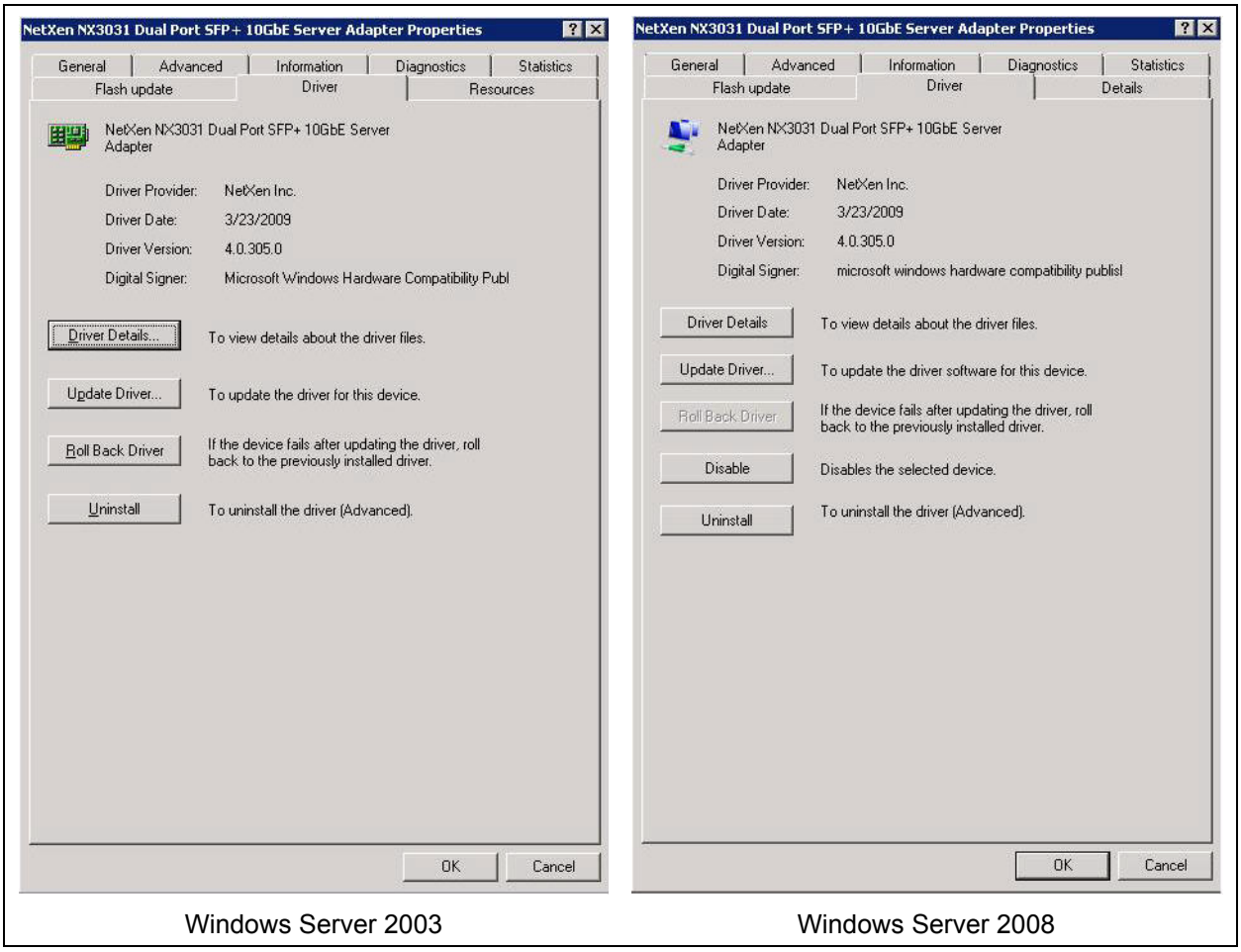


Windows Server 2003 Windows Server 2008

Figure 5-13. Adapter Properties — Flash Update Tab

Driver Tab

Click the **Driver** tab to view driver information and update, uninstall, or restore a previous version of the QLogic adapter driver (Figure 5-14).

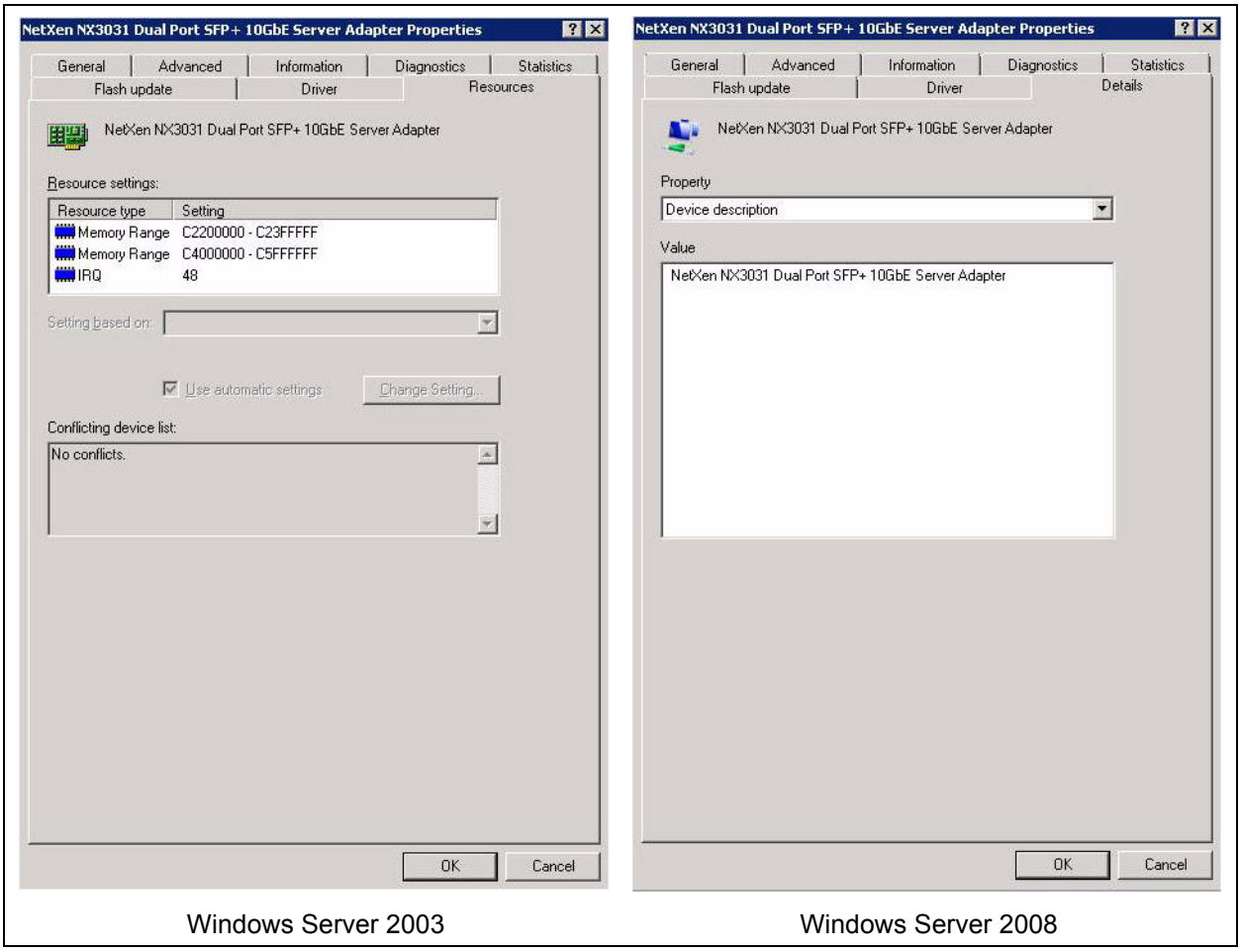


Windows Server 2003 Windows Server 2008

Figure 5-14. Adapter Properties — Driver Tab

Resources Tab

Click the **Resources** tab to view the resource settings for the QLogic adapter (Figure 5-15).



Windows Server 2003 Windows Server 2008

Figure 5-15. Adapter Properties — Resources Tab

Configure the QLogic Adapter in Windows Server

To enable the connections to the QLogic adapter:

1. Open the Network Connections window in the Control Panel, or directly from the desktop if the icon exists (Figure 5-16).

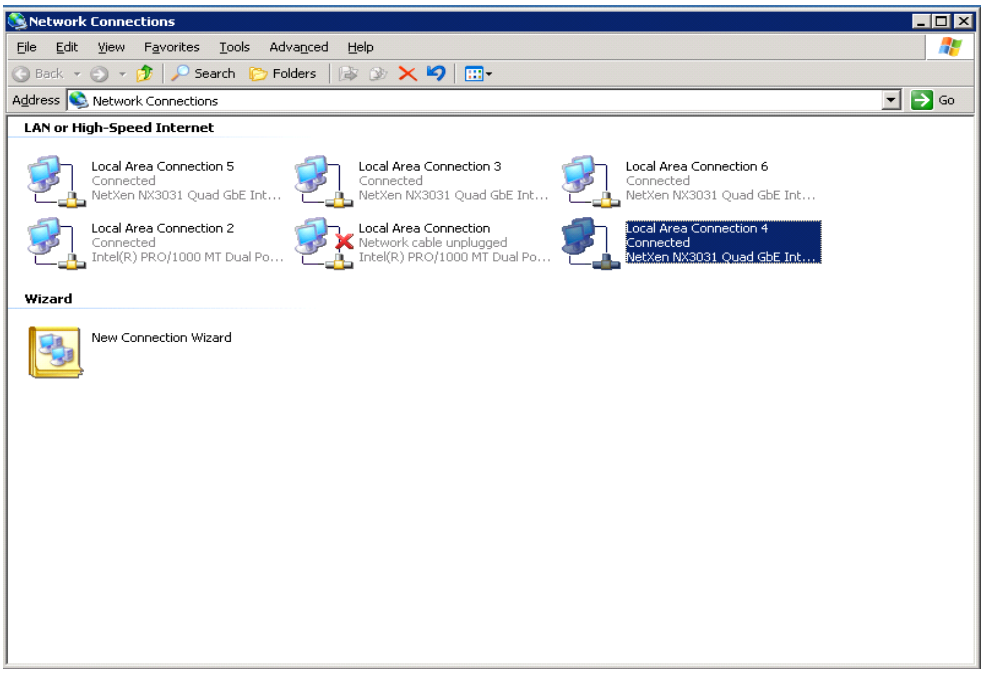


Figure 5-16. Network Connections Window

Note that if an IP address has not been assigned, the QLogic adapter entry says **Limited or no connectivity**.

If there is a red X next to QLogic adapter icon, the link is down. In this case, do the following:

- Verify that the card is seated properly in the PCI slot.
- Make sure that the network cable is connected properly at both ends.
- Make sure that the cable is good.
- Assign an IP address to the interface if you have not already.
- Verify that the SFP+ module is installed correctly (QLE3142).

See Section 9 for more information.

To check the status of the connection, right-click the adapter icon in the Network Connections window and select **Properties**. The Local Area Connection Properties dialog box opens.

2. Assign an IP address manually by selecting the **Internet Protocol (TCP/IP)** entry, and then clicking the **Properties** button (Figure 5-17).

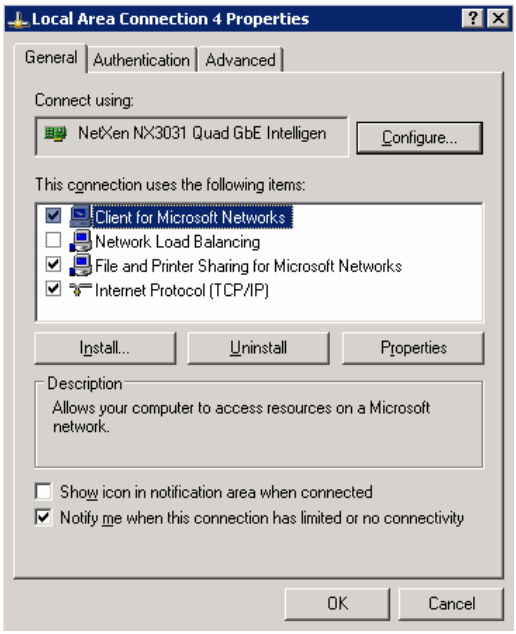


Figure 5-17. Local Area Connection Properties Dialog Box

The Internet Protocol (TCP/IP) Properties dialog box opens.

3. Assign the appropriate IP, subnet mask, and default gateway values In the Internet Protocol (TCP/IP) Properties dialog box (Figure 5-18), and then click the **OK** button.

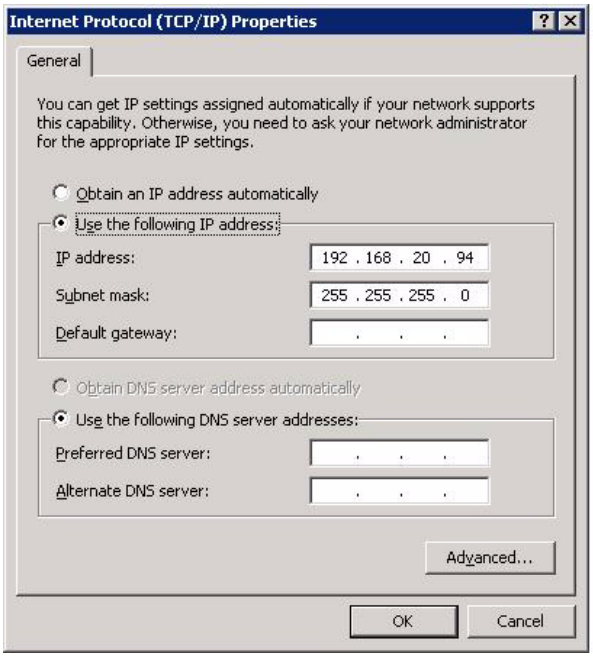

Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 20 . 94
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

Figure 5-18. Internet Protocol (TCP/IP) Properties Dialog Box

4. Verify connectivity with another card or switch using the `ping` utility.

Uninstall the QLogic Adapter Driver in Windows Server

To uninstall the QLogic adapter driver in Windows Server 2003:

1. On the **Start** menu, right-click **My Computer**, and then click **Manage**. The Computer Management window opens.
2. Double-click **Device Manager.** The list of devices in the computer is displayed on the right side of the window.
3. Locate and right-click the QLogic adapter.
4. Click **Uninstall** to perform the operation.

5. Delete the following files for the corresponding directory.

   Windows Server 2003:

   ```
   nxcoinst.dll  C:\WINDOWS\system32
   nx3fwct.bin  C:\WINDOWS\system32\drivers
   nx3fwmn.bin  C:\WINDOWS\system32\drivers
   nxnd5x64.sys  C:\WINDOWS\system32\drivers
   ```

   Windows Server 2008:

   a. Double-click **Computer**, navigate to the local disk (C:), and then to the Windows directory.

   b. Search for **nx*** and remove all of the following files from each of the folder locations found in the search:

   ```
   nxcoinstl.dll
   nx3fwct.bin
   nx3fwmn.bin
   nxnd6x64.sys
   ```

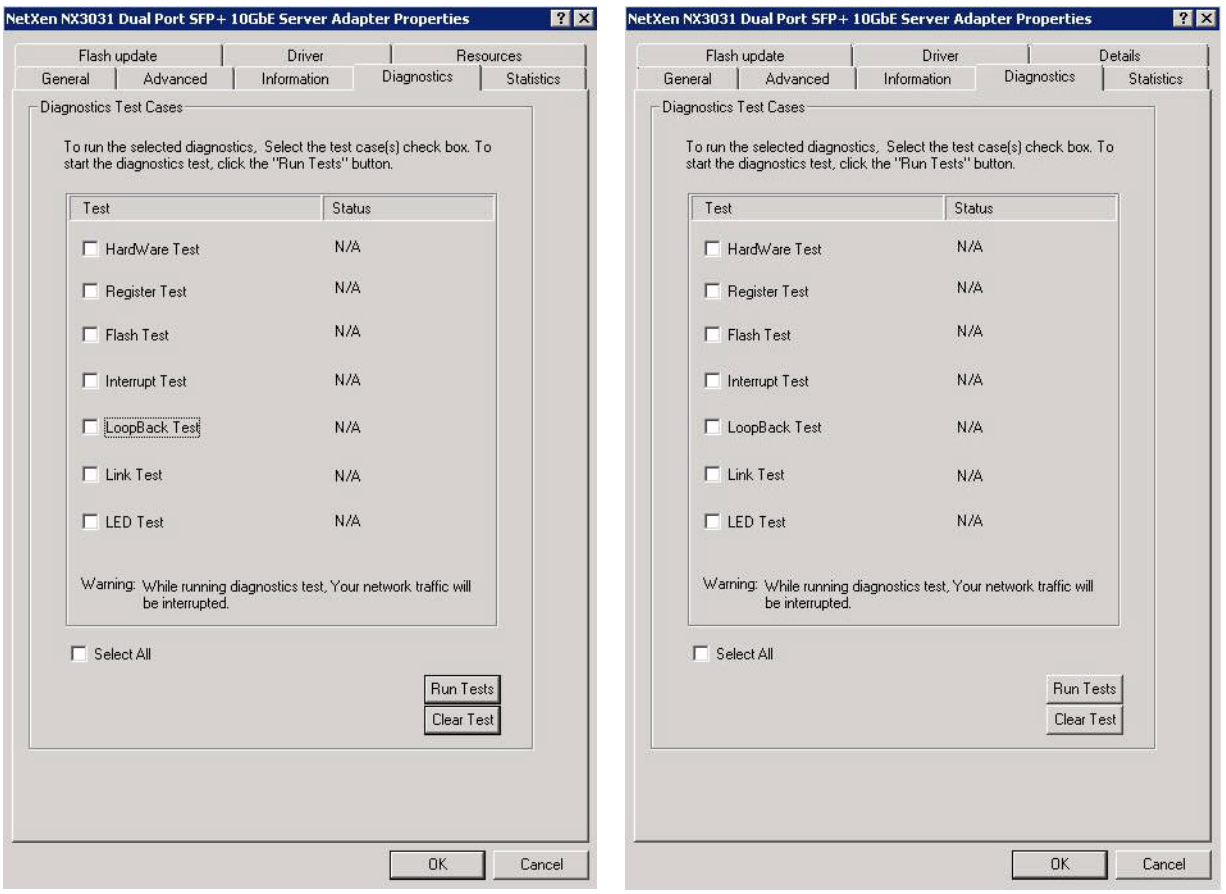
QLogic Adapter Diagnostic Tests — Windows Server

The Windows user diagnostics utility performs different tests using the `nxudiag.exe` command. The syntax for these tests is:

`nxudiag.exe [`*`command-options-and-arguments`*`]`

See Table A-1 for a list of Windows diagnostic command options and arguments. The QLogic adapter will be offline at this time.

Alternately, there is a **Diagnostics** tab in the QLogic adapter property sheet that can perform the same tests (Figure 5-19).



Windows Server 2003 Windows Server 2008

Figure 5-19. Adapter Properties — Diagnostics Tab

Windows Server Performance

This section describes Windows performance tuning.

NOTE:

The tunable performance parameters are system and application specific. Understanding the relationship between the parameter values, target workload, performance applications, operating system, and system configuration provides a better understanding of performance optimization and bottlenecks.

Performance Testing the QLogic Adapter with `ntttcp`

To enhance Windows Server performance, change these parameters in the order listed.

1. Enable Windows Server scaling.

   Set the `TCp1323Opts` parameter value to 1. Note that this parameter is not created by default. For more information about modifying a previously created parameter, or creating a new parameter, see “Tcp1323Opts Parameter” on page 5-29.

2. Set the `TcpWindowSize` parameter.

   In the `TcpWindowSize` parameter window, set the value in the **Value Data** box to either **200000** hexadecimal, or **2,097,152** decimal. Be sure to click either **hexadecimal** or **decimal** in the **Base** box depending on the value entered.

   If the `TcpWindowSize` parameter does not exist, it can be created using `regedit`. See “Setting the TcpWindowSize Parameter” on page 5-32 for more information.

3. Run `ntttcp`.

   a. On the **Start** menu, click **Run**. The Run dialog box opens.

   b. Type **cmd** in the **Open:** box, and then click the **OK** button (Figure 5-20).

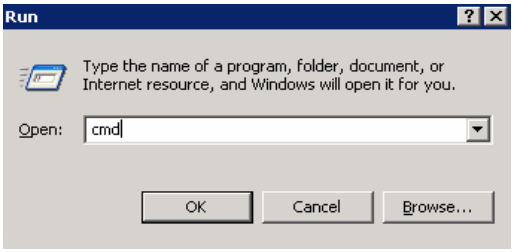


Figure 5-20. Run Dialog Box

c. Change the directory path to the location to where `ntttcp` was downloaded or copied. An example directory tree is shown in Figure 5-21.

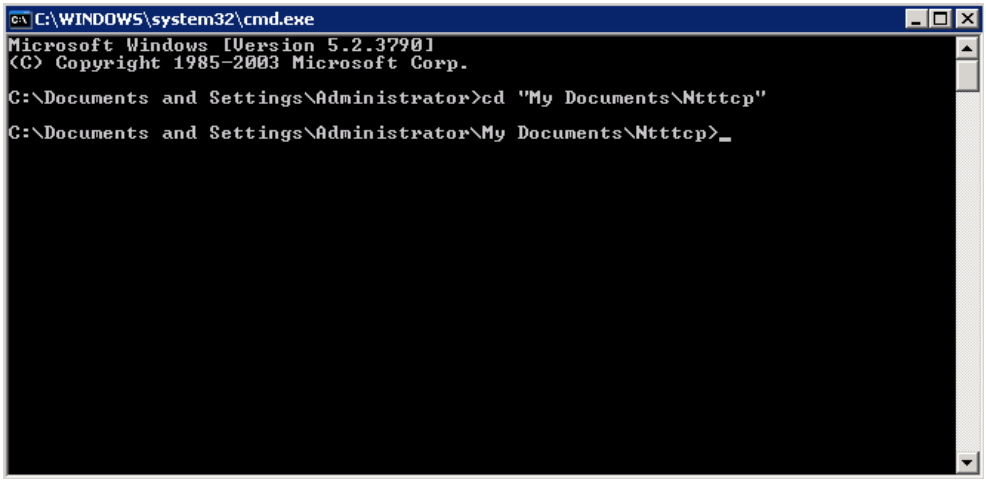


Figure 5-21. Location of `ntttcp`

For scripts, see the tools package included with the release.

`ntttcp` Overview

There are two switches on `ntttcp` that boost performance: `-a` and `-rb`.

`ntttcp` can be run without an optimal value for the `-a` switch and without the `-rb` switch for the QLE3044.

When running `ntttcp` with the QLE3142, and in particular with fewer threads on Windows Server, performance is limited by the receive window and by the outstanding I/O (`-a`) value, regardless of hardware limitations.

For the receive side, the optimal value is 16 for `-a` and 512000 for `-rb` (or something similar). With these values, a single thread should perform closer to a multi-thread configuration. From a DOS command prompt, type the following command. Note that the command must be executed from the same directory in which the executable files are located.

```
ntttcpr -m 16,0,<rcv ipaddr> -n <# of tcp segs for snd/rcv> -a 16
```

For the transmit side, `-a` should be a value less than 8. The more threads, the lower the value.

NOTE:

The send (transmit) and receive side `ntttcp` commands must use the receive side's IP address.

ntttcps and ntttcpr Command Line Options

The ntttcps and ntttcpr command line options are listed in Table 5-2.

Table 5-2. ntttcps and ntttcpr Command Line Options

Command	Default	Notes
-l <*length of buffer*>	64K	
-n <*number of buffers*>	20K	
-p <*port base*>	5001	
-a <*outstanding I/O*>	2	
-x <*packet array size*>	1	
-rb <*receive buffer size*>	64K	
-sb <*send buffer size*>	0	
-i	—	Infinite loop
-f <*file name*>	output.txt	
-u	—	UDP send/receive
-w	—	
-d	—	Verify flag
-t <*runtime*>	—	Runtime is in seconds.
-v	—	Enable verbose mode.
-6	—	Enable IPv6 mode.
-fr	—	Full buffers posted on read operations.
-mb	—	Multiple buffer post mode
-m <*mapping*>	—	*mapping* is a session or sessions, processor, receiver, and IP set. The following example sets up four sessions on processor 0 to test a network on 1.2.3.4: -m 4,0,1.2.3.4

Tcp1323Opts Parameter

This parameter determines whether TCP uses the time-stamping and window scaling features described in *RFC 1323, TCP Extensions for High Performance*.

For more efficient use of high bandwidth networks, use a larger TCP window size. The TCP window size field controls the flow of data and is limited to 2 bytes, or a window size of 65,535 bytes.

Since the size field cannot be expanded, a scaling factor is used. The TCP window option increases the maximum window size from 65,535 bytes to 1 gigabyte. The TCP receive window is the amount of data the sending host can send at one time on a connection.

When the value for window size is added to the registry and its size is larger than the default value, Windows attempts to use a scale value that accommodates the new window size.

Tables 5-3 and 5-4 show the four `Tcp1323Opts` settings.

Table 5-3. Tcp1323Opts

Data Type	Range [a]	Value
REG_DWORD	0 | 1 | 2 | 3	1

Table Notes

[a] See Table 5-4

Table 5-4. Range

Hex Value	Meaning
0	Timestamps and window scaling are disabled.
1	Window scaling is enabled.
2	Timestamps are enabled.
3	Timestamps and window scaling are enabled.

The modify the scale factor, set `Tcp1323Opts` to 1. Note that this parameter is not created by default. To modify a previously created parameter, see “Modifying the Tcp1323Opts Parameter” on page 5-30. To create a new parameter, see “Creating the Tcp1323Opts Parameter” on page 5-31.

Modifying the `Tcp1323Opts` Parameter

If the parameter was created previously, it can be modified as follows:

1. On the **Start** menu, click **Run**. The Run dialog box opens.
2. Type **regedit** in **Open:** box (Figure 5-22), and then click the **OK** button.

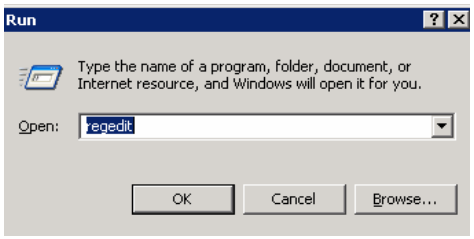


Figure 5-22. Run Window

The Registry Editor window opens.

3. Click the **HKEY_LOCAL_MACHINE** directory (Figure 5-23).

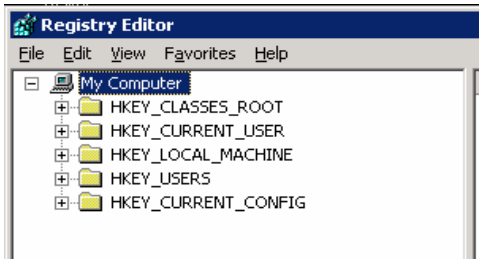


Figure 5-23. Registry Editor — HKEY_LOCAL_MACHINE Directory

4. Navigate to the following directory path from the HKEY_LOCAL_MACHINE directory:

   HKEY_LOCAL_MACHINE
   SYSTEM
   CurrentControlSet
   Services
   Tcpip
   Parameters

5. Locate the `TCp1323Opts` entry and change the value to 1.

Creating the `Tcp1323Opts` Parameter

If the `TCp1323Opts` parameter does not exist, it can be created as follows:

1. On the **Start** menu, click **Run**. The Run dialog box opens.
2. Type **regedit** in the **Open:** box, and then click the **OK** button (Figure 5-22).

   The Registry Editor window opens.
3. Click the **HKEY_LOCAL_MACHINE** directory (Figure 5-23).
4. Navigate to the following directory path from the HKEY_LOCAL_MACHINE directory:

   HKEY_LOCAL_MACHINE
   SYSTEM
   CurrentControlSet
   Services
   Tcpip
   Parameters

   The Registry Editor window displays the parameters on the right side (Figure 5-24).

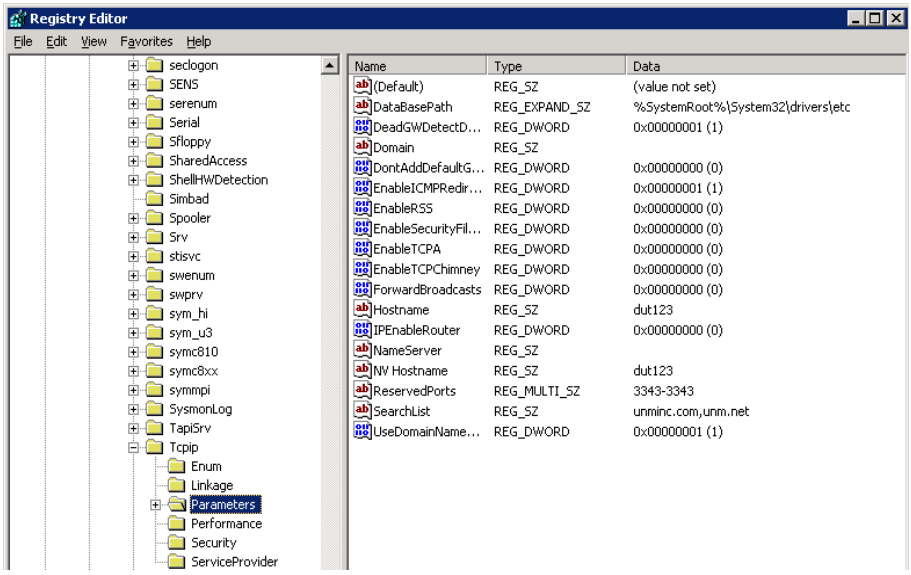


Figure 5-24. Registry Editor — Parameter Directory

5. Right-click anywhere in the right side of the window and create a new key with a **DWORD** value (Figure 5-25).

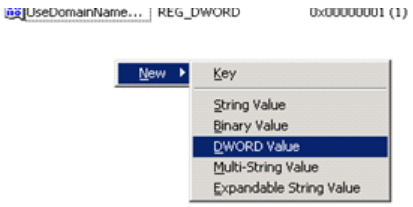


Figure 5-25. New Key — DWORD

6. Rename **New Value #1** to **TCp1323Opts** (Figure 5-26).

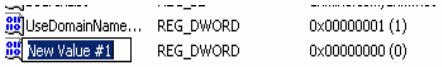


Figure 5-26. Creating `Tcp1323Opts`

7. Right-click **TCp1323Opts**, and then select **Modify**. In the **Value data** box, type **1** (the default value is 0), and then click the **OK** button. (Figure 5-27).

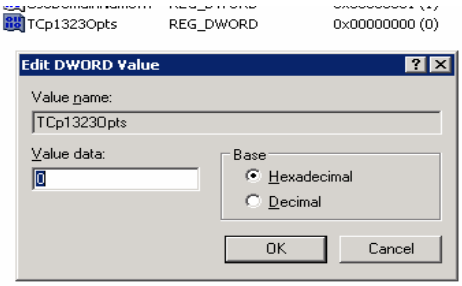


Figure 5-27. Edit DWORD Value Window — `Tcp1323Opts` Parameter

Setting the `TcpWindowSize` Parameter

To set the `TcpWindowSize` parameter:

1. On the **Start** menu, click **Run**. The Run dialog box opens.
2. Type **regedit** in the **Open:** box, and then click the **OK** button (Figure 5-22).
3. Click the **HKEY_LOCAL_MACHINE** directory (Figure 5-23).

4. Navigate to the following directory path from the HKEY_LOCAL_MACHINE directory:

   HKEY_LOCAL_MACHINE
   SYSTEM
   CurrentControlSet
   Services
   Tcpip
   Parameters

   The Registry Editor window displays the parameters on the right side (Figure 5-24).

5. Right-click anywhere in the right side of the window and create a new key with a **DWORD** value (Figure 5-25).

6. Rename **New Value #1** to **TCpWindowSize**.

7. Right-click **TcpWindowSize**, and then select **Modify** (Figure 5-28).

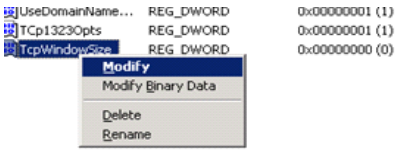


Figure 5-28. Modifying the `TcpWindowSize` Parameter

   The Edit DWORD Value dialog box opens.

8. Type a the value in the **Value data:** box: either **200000** hexadecimal or **2,097,152** decimal. Be sure to click either the **Hexadecimal** or **Decimal** radio button in the **Base** section depending on the value entered (Figure 5-29).

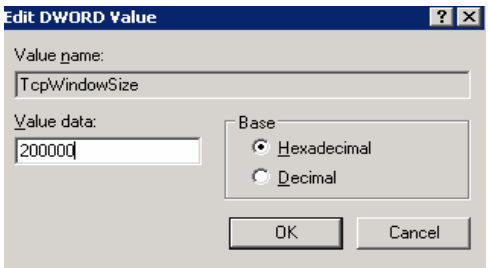


Figure 5-29. Edit DWORD Value Window — `TcpWindowSize` Parameter

   For more information on setting the TCP window size, see “Tcp1323Opts Parameter” on page 5-29.

Notes

6 Linux Driver Installation and Configuration

This section describes the Linux driver installation and configuration procedure. For the Windows Server driver installation procedure, see Section 5.

Linux Driver Checklist

Before installing and configuring the Linux driver, following the instructions in these sections:

- “Locate the Firmware ROM Image” on page 6-1
- “Locate the Driver File” on page 6-2
- “Verify the Firmware Version” on page 6-2
- “Verify the Driver Version and Module Information” on page 6-2
- “Locate the QLogic Tools” on page 6-2
- “Build the Linux Driver Source Code” on page 6-2
- “Enable the Inbox Kernel GPL and Commercial Drivers” on page 6-2
- “Check for MSI-X Support” on page 6-3

Locate the Firmware ROM Image

After installing the binary RPM, the firmware ROM image files (`nx3fwct.bin` and `nx3fwmn.bin`) are placed in the `/lib/firmware` directory (`/usr/lib/hotplug/firmware` for SLES9).

When the driver module is loaded, the firmware files located in the `/lib/firmware` directory are dynamically loaded onto the QLogic adapter.

The dynamically downloaded firmware becomes the active firmware and supersedes the default firmware flashed on the QLogic adapter.

Locate the Driver File

The QLogic adapter driver is located at:

- SUSE: `/lib/modules/[kernel version]/update/drivers/net`
- Red Hat 5: `/lib/modules/[kernel version]/update`
- Red Hat 4: `/lib/modules/[kernel version]/kernel/drivers/net`

Verify the Firmware Version

Type the following commands to view the firmware version, where *n* is the port number:

```
% ethtool -i eth[n]
% dmesg | grep nx
```

Verify the Driver Version and Module Information

Type the following commands to view the driver version and module information, where *n* is the port number:

```
% modinfo nx_nic
% ethtool -i eth[n]
```

Locate the QLogic Tools

Type the following command to go to the directory where the tools are located:

```
% cd /opt/netxen
```

These tools include:

- `nxflash`
- `nxudiag`
- `phantomcore_P3`
- `[card type]-romimage`

Build the Linux Driver Source Code

Linux kernel source/headers are required to compile the drivers provided in source code format. Some Linux operating system (OS) distributions may not install the kernel source/headers by default. The headers can be added from the Linux OS Distribution disk using the RPM package manager.

Enable the Inbox Kernel GPL and Commercial Drivers

The inbox kernel GPL and commercial drivers are included in the Linux kernels available from `kernel.org`.

NOTE:

The commercial GPL version of the driver (`nx_nic.ko`) contains the most recent updates.

To determine which driver to use:

1. See the Release Notes for more information about which Linux distributions contain the inbox kernel GPL driver. The driver name is:

   `netxen_nic.ko`

2. Type the following command to identify the `netxen_nic.ko` driver:

   `% lsmod | grep netxen_nic`

   Note that the `netxen_nic.ko` file is automatically *blacklisted* when the Linux commercial GPL driver RPM is installed.

3. To disable the inbox kernel GPL driver (`netxen_nic.ko`):

   a. Type the following command to remove the driver from the OS memory:

      `% rmmod netxen_nic`

   b. Remove or rename the `netxen_nic.ko` file from the `/lib/modules/<uname -r>/kernel/drivers/net/netxen` directory.

The commercial GPL driver (`nx_nic.ko`) can be enabled after the inbox kernel GPL driver module is disabled.

Check for MSI-X Support

MSI and MSI-X are supported by the QLogic adapter driver and firmware. Ensure that the OS, kernel, and hardware support MSI-X.

Type the following command to see if MSI-X is supported:

`% cat /proc/interrupts`

The output of this command is similar to the following:

```
[root@apps4242 ~]# cat /proc/interrupts
CPU0 CPU1
58: 164 7 PCI-MSI-X eth2
66: 0 0 PCI-MSI-X eth2:1
74: 6 0 PCI-MSI-X eth2:2
82: 0 0 PCI-MSI-X eth2:3
122: 3195 0 PCI-MSI-X eth3
130: 0 0 PCI-MSI-X eth3:1
138: 0 0 PCI-MSI-X eth3:2
146: 0 0 PCI-MSI-X eth3:3
```

NOTE:

Some older Linux kernel versions may not support MSI-X.

Check for Receive Side Scaling (RSS) Support

To support RSS, each port has four MSI-X interrupts to send interrupts to any CPU.

NOTE:

MSI-X support is required for RSS.

Inbox Kernel GPL Driver and Blacklisting

NOTE:

There are two drivers for the QLogic adapter:

- `netxen_nic.ko`. This is the in-kernel (inbox) GPL driver. It is released into the Linux upstream kernel and included in major Linux distributions.
- `nx_nic`. This is the commercial GPL driver released by QLogic.

When the QLogic RPM binary package is installed, the inbox kernel GPL driver (`netxen_nic.ko`) is *blacklisted*. Consequently, when the system is powered up, the `netxen_nic.ko` driver will not load. To prevent this from happening, you can execute the RPM `erase` command (`rpm -e nx_nic-[version]`[1]), which will remove the QLogic RPM binary package so that the blacklisting will revert back to the prior setting and the `netxen_nic.ko` driver will load when the system is powered up.

To check if the inbox kernel GPL driver has been installed on the system, check the `/lib/modules/<kernel-version>/kernel/net/netxen` directory for the `netxen_nic.ko` driver. Remove or rename this file, and then reboot.

Alternately, uninstall the driver by typing the following command before continuing with the following steps in this section.

```
% rmmod netxen_nic
```

The following sections describe how to install a new driver.

Preparing for QLogic Adapter Driver Installation

Check for prior versions of the QLogic adapter driver and tools. Remove the packages from the system to prepare for installing the new release.

Use RPM to check for prior packages. For example, type:

```
% rpm -qa | grep nx_
```

Look for output similar to the following:

```
nx_nic-[prior_version]
nx_tools-[prior_version]
```

Remove each of the prior packages by typing the following commands:

```
% rpm -e nx_nic-[prior_version]
% rpm -e nx_tools-[prior_version]
```

QLogic Adapter Driver Installation (RPM Format)

The following sections describe how to install the Linux driver in RPM format, create the binary, install the binary, and install the QLogic tools.

Install the Linux Driver Source in RPM Format

Type the following command to install the Linux driver RPM source:

```
% rpm -iv nx_nic-[version].src.rpm
```

[1] [*version*] refers to the RPM package currently on the system. RPM packages can be located by typing the command: `rpm -qa | grep nx_`.

Create the Binary

Type the following command to create the binary RPM for Red Hat systems:

```
% rpmbuild -bb usr/src/redhat/SPECS/nx_nic-[version].spec
```

Type the following command to create the binary RPM for SUSE systems:

```
% rpmbuild -bb usr/src/packages/SPECS/nx_nic-[version].spec
```

Install the Binary

Type the following command to install the binary RPM for Red Hat systems:

```
% rpm -i usr/src/redhat/RPMS/[arch]/nx_nic-[version].[arch].rpm
```

Type the following command to install the binary RPM for SUSE systems:

```
% rpm -i usr/src/packages/RPMS/[arch]/nx_nic-[version].[arch].rpm
```

In the previous commands, the *[arch]* variable designates the system architecture. Some *[arch]* variables include i386, i586, i686, x86_64, depending on the system. The installed QLogic driver binary will be located in one of the following two directories:

```
/lib/modules/<uname -r>/updates/drivers/net/
/lib/modules/<uname -r>/kernel/drivers/net
```

Install the QLogic Tools

Execute the following command to install the tools:

```
% rpm -ivh nx_tools-[version].rpm
```

Type the following command to go to the directory where the tools are located:

```
% cd /opt/netxen
```

These tools include:

- nxflash
- nxudiag
- phantomcore_P3
- *[card type]*-romimage (*[card type]* refers to the exact ROM image)

The release may contain multiple ROM images. See the Release Notes for more information on the ROM image types.

Linux QLogic Adapter Driver Options

Type the modprobe command to pass optional parameters to the driver, for example:

```
% modprobe -v nx_nic <parameter>
```

The parameters are listed in Table 6-1.

Table 6-1. `modprobe` Command Optional Parameters

Parameter	Description	Default	Range
`tx_desc`	Sets the size of the command descriptor rings (transmit).	1024	256–1024 (must be power of two)
`jumbo_desc_1g`	Sets the size of the receive ring for jumbo frames (1GbE ports).	1024 (x86 64 bit) 512 (x86 32 bit)	64–1024 (must be power of two)
`jumbo_desc`	Sets the size of the receive ring for jumbo frames (10GbE ports).	1024	64–1024 (must be power of two)
`rdesc_1g`	Sets the size of the receive ring for normal packets (1GbE ports) For firmware version 4.0.*xyz*, the maximum size is 8192.	8192 (x86 64 bit) 2048 (x86 32 bit)	64–8192 (must be power of two)
`rdesc_10g`	Sets the size of the receive ring for normal packets (10GbE ports). For firmware version 4.0.*xyz*, the maximum size is 8192.	8192 (x86 64 bit) 4096 (x86 32 bit)	64–8192 (must be power of two)
`use_msi`	Enables MSI interrupts.	1	0: Disabled 1: Enabled
`use_msi_x`	Enables MSIx interrupts. This parameter is available only in kernel versions later than 2.6.8. When this parameter is enabled, it takes precedence over MSI interrupts and the `use_msi` parameter is ignored.	1	0: Disabled 1: Enabled
`rss_enable`	Enables receive side scaling. This parameter is available only when MSI-X interrupts are enabled.	1	0: Disabled 1: Enabled

`Ethtool` Utility

The `ethtool` utility checks and configures additional driver options. See the `nx_nic` Linux man pages for driver option configuration examples. See the `ethtool` Linux man pages for additional details. Here is an example command:

```
% ethtool -K eth[n] tso off
```

Configure the QLogic Adapter on Linux

To configure the QLogic adapter:

1. Type one of the following commands to identify the Ethernet interface (`eth1`, `eth2`, etc.) and the `nx_nic` driver from the command line:

   `% cat /proc/net/nx_nic/dev0/stats | grep eth` or

   `% ifconfig -a`

   Look for the interface with a MAC address (HWaddr) prefix of `00:0E:1E:`*`XX`*`:`*`XX`*`:`*`XX`*

2. Type the following to commands assign an IP Address and activate the interface:

   `% ifconfig eth[`*`n`*`] down`

   `% ifconfig eth[`*`n`*`] <`*`IP Address`*`> netmask <`*`Netmask Value`*`> up`

3. Verify that the network services are running, and then type:

   `% service network restart`

   `Ping` a different IP address to verify connectivity.

Uninstall the Commercial GPL Driver and Tools Package

Type the following commands to uninstall the commercial GPL driver and tools, which are part of the RPM package:

`% rpm -qa | grep nx_`

`% ifconfig eth[`*`n`*`] down`

`% rmmod nx_nic.ko`

`% rpm -e nx_nic-[`*`version`*`]`[1]

`% rpm -e nx_tools-[`*`version`*`]`

Diagnostic Tests for the QLogic Adapter

The Linux user diagnostics utility performs various tests using the `./nxudiag -i eth[`*`n`*`]` command.

The syntax for these tests is:

`% ./nxudiag [`*`command-options-and-arguments`*`]`

See Table A-1 for a list of Linux diagnostic utility commands.

[1] `[`*`version`*`]` refers to the RPM package currently on the system. RPM packages can be located by executing the command: `rpm -qa | grep nx_`.

NOTE:

While running these tests, the network traffic will be interrupted.

Linux Performance Tuning

This section describes Linux performance tuning.

NOTE:

The tunable performance parameters are system and application specific. Understanding the relationship between the parameter values, target workload, performance applications, operating system, and system configuration provides a better understanding of performance optimization and bottlenecks.

Performance Tools

Add the following parameters for performance tuning on Linux systems in the `/etc/sysctl.conf` file:

```
net.core.rmem_max = 16777216
net.core.wmem_max = 16777216
net.core.optmem_max = 524287
net.core.netdev_max_backlog = 250000
net.ipv4.tcp_rmem = 4096 87380 16777216
net.ipv4.tcp_wmem = 4096 87380 16777216
net.ipv4.tcp_timestamps = 0
net.ipv4.tcp_sack = 1
net.ipv4.tcp_low_latency = 0
net.ipv4.tcp_window_scaling = 1
net.ipv4.tcp_moderate_rcvbuf = 1
net.ipv4.route.flush = 1
```

NOTE:

Various factors including tools, kernel, stacks, and related parameters affect system performance.

Using the `iperf` Tool

The `iperf` tool measures network performance. The following paragraphs show how to use `iperf`; however, it can be further tuned depending on your system's requirements.

Here is an example of `iperf` from the server side:

```
% iperf -s -w lM -l 16k
```

Here is an example of `iperf` from the client side:

```
% iperf -c <ipAddr of Server> -w 1M -P12 -l 16k -P<number of threads>
```

Optimization

Note the following:

- PCIe x8 provides optimal performance for 10GbE.
- MSI and MSI-X interrupts perform better than legacy interrupts.
- Linux kernel versions 2.6.15 or later provide better performance optimization.
- Check CPU utilization on the host for CPU-bound bottlenecks.

7 Linux Configuration for Bonding Mode and Virtual LAN (VLAN)

Linux Bonding Mode

Ensure that the steps required for installing the RPM source, creating the binary, and installing the binary have been performed as described in “QLogic Adapter Driver Installation (RPM Format)” on page 6-5 before setting up Linux bonding mode.

Type the following command to verify that the QLogic adapter driver has been installed:

```
% lsmod | grep nx_nic
```

Type the following command to install the driver (if it has not yet been installed):

```
% modprobe -v nx_nic
```

The steps for setting the Linux bonding mode are as follows. Note that these are example commands. The actual commands may be different depending on the system configuration.

1. `% modprobe bonding mode=1 miimon=100 updelay=50000 primary=eth16`
2. `% ifconfig bond0 25.145.1.199 netmask 255.255.255.0 broadcast 25.145.1.255 up`
3. `% ifenslave bond0 eth15 eth16`

Type the following command to bring down the bond:

```
% ifconfig bond0 down
```

NOTE:

These commands and steps have been tested under RHEL5. Other Linux distributions and versions may enable and utilize bonding differently.

After bonding, the MAC addresses for the two ports that were bonded appear to be the same when running the `ifconfig` command. This is due to the formation of a bond to permit traffic to be passed between the ports.

After the bond has been brought down and the bonding driver removed, the QLogic adapter's original MAC addresses will resume on the ports.

Active-Backup or Mode=1

The active-backup policy allows only one slave in the bond to be active. A different slave becomes active only if the active slave fails.

By setting `mode=1`, when `ifenslave` is executed, the bonding driver calls into the `bond_enslave()` function and sets the slave link modes for the corresponding two Ethernet ports to `BOND_LINK_DOWN`.

When the bond mode is 1 (`BOND_MODE_ACTIVEBACKUP`) and the primary device is indicated, one slave device is configured as the active slave. The `dmesg` command displays the primary port. Here is an example output of the `dmesg` command:

```
bonding: bond0: making interface eth16 the new active one 0 ms
earlier
```

If the active connection goes down, then the slave port becomes the primary port. Type the following command to monitor the bonding process during the switch-over or port priority:

```
% cat /proc/net/bonding/bond0
```

The following message is displayed:

`MII Status: up` (for `eth16`)

The `dmesg` command can show the status of the slave port, for example:

```
bonding: bond0: link status up for interface eth15, enabling it in
50000 ms.
```

Type the following command to check the status of the primary port:

```
% cat /proc/net/bonding/bond0
```

The output for this command is:

`MII Status: down` (for `eth16`)

After 50 seconds, the `dmesg` command will print:

```
bonding: bond0: link status definitely up for interface eth15.
bonding: bond0: making interface eth15 the new active one.
```

Type the following command to check the status of the new primary port:

```
% cat /proc/net/bonding/bond0
```

The output for this command is:

`MII Status: up` (for `eth15`)

Round-Robin or Mode=0

This mode implements a round-robin scheme between the two Ethernet ports. To set the round-robin mode, type the following command:

```
% modprobe bonding mode=0 miimon=100 updelay=50000 primary=eth16
```

After the command is executed, both links delay for 50 seconds before their states are set to `BOND_LINK_UP`.

Type the following command to check the status of the bonding process:

```
% cat /proc/net/bonding/bond0
```

The output for this command is:

```
Ethernet Channel Bonding Driver: v3.0.1
Bonding Mode: load balancing (round-robin) MII Status: up MII
Polling Interval (ms): 100 Up Delay (ms): 50000 Down Delay (ms): 0
Slave Interface: eth16
MII Status: down                        <========== down state
Link Failure Count: 0
Permanent HW addr: 00:0e:1e:00:11:d2

Slave Interface: eth15
MII Status: down                        <========== down state
Link Failure Count: 0
Permanent HW addr: 00:0e:1e:00:11:d3
```

After 50 seconds, type the command again to verify the MII status of the Ethernet ports:

```
% cat /proc/net/bonding/bond0
```

The output for this command is:

```
Ethernet Channel Bonding Driver: v3.0.1 (January 9, 2006)
Bonding Mode: load balancing (round-robin) MII Status: up MII
Polling Interval (ms): 100 Up Delay (ms): 50000 Down Delay (ms): 0

Slave Interface: eth16
MII Status: up                          <========== up state
Link Failure Count: 0
Permanent HW addr: 00:0e:1e:00:11:d2
Slave Interface: eth15
MII Status: up                          <========== up state
Link Failure Count: 0
Permanent HW addr: 00:0e:1e:00:11:d3
```

The `dmesg` command output is:

```
bonding: bond0: link status definitely up for interface eth16.
bonding: bond0: link status definitely up for interface eth15.
```

Bonding Driver Options

Options for the bonding driver are supplied as parameters to the bonding module at load time. They may be given as command line arguments to the `modprobe` command, but are usually specified in the `/etc/modules.conf` or `/etc/modprobe.conf` configuration file, or in a distribution-specific configuration file (some of which are detailed in the next section).

Bonding Driver Parameters

The available bonding driver parameters are listed in the following sections. If a parameter is not specified, the default value is used. When initially configuring a bond, QLogic recommends that `tail -f /var/log/messages` be run in a separate window to watch for bonding driver error messages.

It is critical to specify the following parameters; otherwise, serious network degradation will occur during link failures.

- `miimon` or `arp_interval` and
- `arp_ip_target`

Most devices support `miimon`, so it is safe to use.

Options with textual values will accept either the text name or, for backwards compatibility, the option value. For example, `mode=802.3ad` and `mode=4` set the same mode.

arp_interval

This parameter specifies the ARP link monitoring frequency in milliseconds. When ARP monitoring is used in an etherchannel compatible mode (modes 0 and 2), the switch must be configured in a mode that evenly distributes packets across all links.

When the switch is configured to distribute the packets in an XOR fashion, all replies from the ARP targets are received on the same link, which could cause the other team members to fail. ARP monitoring should not be used with `miimon`. A value of 0 disables ARP monitoring. The default value is 0.

arp_ip_target

This parameter specifies the IP addresses to use as ARP monitoring peers when `arp_interval` is greater than 0. These are the targets of the ARP request sent to determine the health of the link to the targets.

Specify these values in `ddd.ddd.ddd.ddd` format. Multiple IP addresses must be separated by a comma. At least one IP address must be given for ARP monitoring to function. The maximum number of targets that can be specified is 16. The default value is no IP addresses.

downdelay

This parameter specifies the time, in milliseconds, to wait before disabling a slave after a link failure has been detected. This option is valid only for the `miimon` link monitor. The `downdelay` value must be a multiple of the `miimon` value; otherwise, the value will be rounded down to the nearest multiple. The default value is 0.

lacp_rate

This parameter specifies the rate at which the link partner transmits LACPDU packets in 802.3ad mode. Possible values are:

- Slow or 0: Request partner to transmit LACPDUs every 30 seconds (default).
- Fast or 1: Request partner to transmit LACPDUs every 1 second.

QLogic Adapter Bonding Modes Under Linux

There are several modes that can be used for bonding the QLogic adapter under Linux. Note that there are variations in support and usage with respect to the hardware and Linux distributions, and that not all the modes are favorable for a given system and network topology.

The bonding modes are described in Table 7-1.

Table 7-1. Bonding Modes

Mode Number	Mode Name	Description
0	`balance-rr`	This mode uses a round-robin policy; it transmits packets in sequential order from the first available slave through the last. This mode provides load balancing and fault tolerance.
1	`active-backup`	In this mode, one slave interface is active at any time. If one interface fails, another interface takes over the MAC address and becomes the active interface. This mode provides only fault tolerance. This mode does not require special switch support.
2	`balance-xor`	In this mode, transmissions are balanced across the slave interfaces based on ((source MAC) XOR (dest MAC)) modulo slave count. The same slave is selected for each destination MAC. This mode provides load balancing and fault tolerance.
3	`broadcast`	This mode transmits everything on all slave interfaces. This mode provides fault tolerance.
4	`802.3a`	This mode provides classic IEEE 802.3ad dynamic link aggregation. It requires 802.3ad support in the switch and driver support for retrieving the speed and duplex of each slave.
5	`balance-tlb`	This mode provides adaptive transmit load balancing. Incoming traffic is received only on the active slave. Outgoing traffic is distributed according to the current load on each slave. This mode does not require special switch support.
6	`balance-alb`	This mode provides adaptive load balancing (both transmit load balancing (TLB) and receive load balancing) for IPv4 through ARP negotiation. This mode does not require special switch support, but does require the ability to change the MAC address of a device while it is open.

Configuring Virtual LAN (VLAN) Under Linux

To configure the VLAN function:

1. Type the following command to see if the `8021q.ko` driver has been loaded:

   ```
   % lsmod | grep 8021q
   ```

   Type the following command if the driver has not been loaded:

   ```
   % modprobe -v 8021q
   ```

2. The `vconfig add` command creates a VLAN device on `eth0` and will, in turn, create an `eth0.5` interface. Type the following command for `eth0` to add VLAN ID 5:

   ```
   % vconfig add eth0 5
   ```

3. Type the `ifconfig` command to assign an IP address to the VLAN interface:

   ```
   % ifconfig eth0.5 192.168.1.100 netmask 255.255.255.0
   broadcast 192.168.1.255 up
   ```

4. Type the following command to get detailed information about the VLAN interface:

   ```
   % cat /proc/net/vlan/eth0.5
   ```

Repeat Steps 2 and 3 if more than one VLAN is required.

Type the following commands to delete a VLAN interface:

```
% ifconfig eth0.5 down
% vconfig rem eth0.5
```

Notes

8 Firmware Management

This section describes the firmware download process. When the driver package is installed, the firmware files are installed onto the host operating system (OS).

The dynamic firmware download takes place when the driver module is loaded. As the driver module is loaded, the firmware file downloaded from the host OS becomes the active firmware version on the QLogic adapter.

Windows Server Dynamic Firmware Download

During the driver installation process, the firmware ROM image files are placed in the `C:\WINDOWS\system32\drivers` directory.

Type the following command to determine if the firmware loaded successfully in Windows Server. The `n` in "`Local Area Connection n`" refers to the port being flashed.

`nxflash.exe -i "Local Area Connection n" --info` (the quotation marks are required)

Check for the following entry:

```
Active Firmware version: 4.0.305
```

To determine the port number (`n`), click **Start**, right-click **My Network Places**, and then click **Properties**. The Network Connections window opens.

The Network Connections window lists all of the ports and the type of device to which they are connected.

Linux Dynamic Firmware Download

After the installation of the driver RPM, the firmware ROM image files are placed in the `/lib/firmware` directory (`/usr/lib/hotplug/firmware` for SLES9).

When the driver is installed, the firmware file located in the `/lib/firmware` directory is dynamically loaded onto the QLogic adapter.

Type the following command to determine if the firmware has loaded successfully. The `[n]` refers to the port number.

`ethtool -i eth[n]`

Check for the following entry:

```
Active Firmware version: 4.0.305
```

9 Troubleshooting Guidelines

Unable to Boot the Host System with the QLogic Adapter Installed

If the system does not boot after installing the QLogic adapter:

1. Remove the QLogic adapter and power up the system. Does the system boot without the QLogic adapter? If so, power down the system, insert the QLogic adapter into a different PCIe slot, and power up the system.
2. Ensure that the system BIOS configuration is up to date during the system boot up process.
3. Ensure that the recommended minimum memory is installed on the host system.
4. Note any error messages that appear during the operating system (OS) boot sequence.
5. Check for system error messages:
   - Windows event viewer
   - `% dmesg` (display system messages on Linux)

Unable to Send/Receive Network Traffic Using the QLogic Adapter

If network traffic cannot be sent/received with the QLogic adapter:

1. Ensure that the network cable is plugged in properly.
2. Ensure that the SFP+ module is installed correctly (see “QLE3142 Installation” on page 4-4).
3. Ensure that the client machine is configured correctly and able to communicate with other machines.
4. Type **`lspci -v`** and look for vendor ID `4040`.
   a. Check to see if the QLogic adapter is visible on the PCI bus.
   b. Check to see if the QLogic adapter is plugged into the appropriate PCIe slot.

5. Check if the driver is loaded correctly and the card is initialized.
   - Windows event viewer
   - `dmesg` (display system messages on Linux)
6. Check the network configuration.
   a. Check for a valid IP address and subnet.
   b. Check for duplicate IP address and subnet numbers.
   c. Check the gateway address and network path (if connected through a gateway).
   d. Check the QLogic adapter MAC address values.
   e. Verify the network link status as seen by the host OS.
   f. Check for LED activity (using `ping`).
   g. Analyze the transmit and receive packets for the QLogic adapter using network monitoring tools.
   h. Verify the ARP entry and response.

If none of the previous steps resolve the problem, run the QLogic user diagnostics.

Troubleshooting Tools

The following sections explain how to use the tools under Windows and Linux to help solve potential problems.

Windows Server Tools

The troubleshooting tools available in Windows Server are described in Table 9-1.

Table 9-1. Troubleshooting Tools in Windows Server

Tool	What it Provides
`systeminfo`	`systeminfo` provides detailed information about the operating system version, CPU, system manufacturer and model, memory configuration, hot fixes, and network cards.
Device manager	The device manager shows the hardware configured on the system.
Driver tab	The driver tab displays device status, QLogic adapter information, debug counters for gathering support log details, diagnostics test cases, statistics, driver version, and resources (see “Driver Tab” on page 5-19).

Table 9-1. Troubleshooting Tools in Windows Server (Continued)

Tool	What it Provides
`ipconfig`	`ipconfig` shows IP network settings; it also releases and renews by adapter or connection.
Windows event log	The Windows event log is the main source of information for device driver problems and events. The QLogic adapter's device drivers indicate status by logging events in the system event log.

Linux Tools

The troubleshooting tools available in Linux are described in Table 9-2.

Table 9-2. Troubleshooting Tools in Linux

Tool	What is Provides
`nxdebug1`	Linux script does not require the `nx_nic` driver to be loaded and gathers information on the kernel, any GPL or `nx_nic` driver loaded, RPM packages, processor, memory, interrupts, PCI bus, `dmesg` (last 50 messages), and network configuration.
`nxdebug2`	Linux script does require the `nx_nic` driver to be loaded and gathers kernel configuration, `nx_nic` device stats, multicast settings, `nx_nic` driver messages from the `/var/log/messages` file, `modprobe` info, SLAB information, buddy information, I/O memory information, `sys-ctl` information, the complete `dmesg` log, `ethtool` details on the `nx_nic` interface, and specific `nx_nic` status.

Check for System Errors

Linux

The following paragraphs describe how to check for system errors in Linux:

- Check for error messages from the kernel using the following commands:

```
% dmesg
% cat /var/log/messages
```

- Check routing table, gateway, and IP address conflicts for all interfaces using the following command:

```
% route
```

- Check network interface transmit and receive counts during `pings` using the following command:

  `% ifconfig <network interface>`

- Use the `wireshark`, `ethereal`, `tethereal`, or `tcpdump` utilities to capture packets.

Windows Server

The following paragraphs describe how to check for system errors in Windows Server:

- Use the `wireshark` or `ethereal` utilities to capture packets.
- Check for system error messages using the Windows event viewer.

Caveats

MSI-X Interrupts for Linux

Newer Linux OS distributions or kernel versions support MSI-X interrupt; some older versions do not support MSI-X. If MSI-X is not available on the OS, then use MSI or legacy mode in the OS.

Type the following command on the Linux host to check that PCI-MSI-X or PCI-MSI is enabled for the Ethernet interface:

```
% cat /proc/interrupts
```

Determine if the installed Linux kernel has the MSI configuration option enabled (earlier versions of the kernel may require an MSI patch).

Type the following command from the directory `/usr/src/kernels/<kernel version>` and verify that the MSI configuration option is supported/enabled:

```
% make menuconfig
```

PCI Express Slot

The QLogic adapter can be located on the PCI Express bus using the following Linux procedures.

- **Determine the vendor and device ID.** To check if the PCIe slot has a x8 link for optimal PCIe performance, first determine the PCI vendor ID and device ID codes by typing the following command:

  ```
  % lspci -n
  ```

  You should see a message similar to:

  ```
  06:00.0 0200: 4040:0100 (rev 42)
  ```

The QLogic vendor ID is 0x4040. A list of QLogic adapter device IDs is listed in Table 9-3.

Table 9-3. QLogic Adapter Device IDs

Product	Device ID	Description
QLE3044	0124	Quad-port 1GbE copper interface
QLE3142-CU	0126	Dual-port 10GbE with twinax interface
QLE3142-SR	0126	Dual-port 10GbE with short range fiber interface
QLE3142-LR	0126	Dual-port 10GbE with long range fiber interface

- **Determine the interface attributes.** To determine the attributes of the interface, type the following command:

  ```
  % lspci -n -d 4040:0100 -vvv | grep -i width
  ```

  You should see a message similar to:

  ```
  Link: Supported Speed 2.5 Gb/s, Width x8, ASPM L0s, Port 0
  Link: Speed 2.5Gb/s, Width x8
  ```

- **Determine the width parameters.** Check if the `lspci` output **“**negotiated width” (the second width in the output) reflects the actual “supported width”. In an system with a QLE3044, for example, type the following command to determine if these two widths are the same:

  ```
  % lspci -xxx -vvv -d 4040:0100
  ```

  In the previous command, `4040` indicates the QLogic vendor ID and `0124` indicates a QLE3044. The device ID is 0126.

  Examine the following hex output:

  ```
  ..... 82 04 00 00 01 00 82
  ```

  Supported link width

  Negotiated link width

From the `lspci` hex output:

```
c0: 10 00 02 00 02 80 00 00 00 10 0b 00 82 04 00 00
                                        ^
                                        ||_________ capability. “82 04" = x8 PCIe Gen2
```

Note that some PCIe chip sets with a x16 link may not support a x8 PCI Express link width. A link is required to support only its maximum width and x1. Check the motherboard specification to determine if its PCIe x16 slot can autonegotiate to x8.

On some motherboards, the PCIe slots are all the same physical size required by a x16 slot, but electrically they are different widths. Check the motherboard specification for the supported width of each of the PCIe slots.

Windows Server 2003 RSS and SNP Support

If you have problems with server applications when RSS or SNP is enabled under Windows Server 2003 with SP2 (in offload mode), go to the following link and see if Microsoft has addressed the specific issue.

http://support.microsoft.com/kb/948496

Read the bulletin entitled: *An update to turn off default SNP features is available for Windows Server 2003-based and Small Business Server 2003-based computers*.

A Diagnostic Utility Commands

Table A-1 lists user-level diagnostic utility commands for the Linux and Windows Server OSes.

Table A-1. Diagnostic Utility Commands

Command	Description
`-i` `--interface`	This command specifies the interface type (Local Area Connection 1, Local Area Connection 2, etc.).
`-a` `--all`	This command performs all tests, regardless of the default.
`-D` `--default`	This command performs only the default test.
`-R` `--CRegs`	This command tests all control registers (default).
`-F` `-FLASH`	This command tests the Flash (default).
`-I` `--IRQS`	This command tests the interrupt mechanism (default).
`-L` `--IntLB`	This command performs an internal loopback test (default).
`-H` `--Hw`	This command performs a hardware test (default).
`-S` `--LinkST`	This command tests the link status (default).
`-l` `--LED`	This command tests the LEDs (default).

Table A-1. Diagnostic Utility Commands (Continued)

Command	Description
-nR --noCRegs	This command disables control register testing (use with -D or -a).
-nF --noFLASH	This command disables Flash testing (use with -D or -a).
-nI --noIRQS	This command disables interrupt testing (use with -D or -a).
-nL --noIntLB	This command disables internal loopback testing (use with -D or -a).
-nH --noHw	This command disables hardware testing (use with -D or -a).
-nS --noLinkSt	This command disables link status testing (use with -D or -a).
-nl --noLED	This command disables LED status testing (use with -D or -a).
-E --ExtLB	This command performs an external full-duplex loopback test.
-h --help	This command prints the help message.
-v --version	This command displays version information.
-C --Cmdif	This command performs an interface status test. ***NOTE:*** This command is valid only in Linux.

B Solaris Driver, nxflash Utility, and Firmware Installation

QLogic Adapter Driver Installation

To extract and install the Solaris QLogic adapter driver using the Sol<*ver*>_ntxn_1.7.tar.gz package:

1. Unzip the driver package file using the `gunzip` command.
2. Untar the driver package file using the `tar xfp` command.
3. Remove any previous driver version.
   a. Type one of the following commands:

      For a 64-bit operating system (OS), type:

      pkgchk -l -p /kernel/drv/amd64/ntxn

      For a 32-bit OS, type:

      pkgchk -l -p /kernel/drv/ntxn

   b. For both OSes, type the following commands:

      pkgchk -l NTXNxge

      pkgrm NTXNxge
4. Install the new driver, pointing to the directory where `/NTXNxge` is located. For example:

   pkgadd -d /tmp/Sol<*ver*>_ntxn_1.7/Solaris
5. Type the following to make sure that the package is installed:

   pkginfo -l NTXNxge

nxflash Utility and Firmware Files Installation

To extract and utilize the Solaris nxflash utility and firmware files using the Sol<*ver*>_ntxn_<*ver*>_tools.tar.gz and Sol_nxtn_<*ver*>_firmware_files.gz packages:

1. Unzip the firmware package using the gunzip command.
2. Untar the firmware package using the tar xfp command.
3. Unzip the tools package using the gunzip command.
4. Untar the tools package using the tar xfp command.
5. Type the following to navigate to the tools directory:

   cd /tmp/Sol<*ver*>_ntxn_4.0.305_tools
6. Copy the QLogic romimage files into the tools directory by typing:

   cp <*path*>/Sol_ntxn_<*ver*>_firmware_files/*
7. Perform the Flash update by using nxflash. For Solaris 10, type the following command:

   ./nxflash –i /dev/ntxn0 –a <*file*>_romimage
8. After the nxflash utility has finished, reboot the system.

C Flash Update

Under rare circumstances, it may be necessary update the Flash on the QLogic adapter. Read the Release Notes to see if a Flash update is required. If so, follow the instructions in this appendix.

Flash Update and Tool Guidelines

Consider the following before updating the Flash:

- During the Flash update process, do not reboot or stop the update process.
- A backup image of the existing Flash will be created at the start of the Flash update process. The Flash utility will use the backup image to recover if required.
- The Flash tool will not start the Flash update process if the QLogic adapter driver is not loaded.
- The Flash tool auto-identifies the appropriate Flash image for the QLogic adapter.

Flash Update Options

Options for updating the Flash are listed below and described in the following sections. Do use these options unless specified in the Release Notes.

- "nxflash Command" on page C-1
- "NX Live CD" on page C-2
- "NX Live USB" on page C-2

`nxflash` Command

Run the appropriate command from Linux or Windows Server, as described in the following paragraphs.

Windows Server

Type the following command, where "`Local Area Connection n`" specifies the adapter being flashed:

`nxflash -i "Local Area Connection n" --all` (the quotes are required)

You are prompted to answer Y(es) or N(o) to allow the upgrading of the Flash to continue. Press the **Y** key to continue.

See "QLogic Adapter Flash Update — Windows Server" on page C-3 for more information.

Linux

Type the following command, where `[n]` indicates the number of the Ethernet device (0, 1, 2, etc.):

```
./nxflash -i [n] --all
```

See "QLogic Adapter Flash Update — Linux" on page C-8 for more information.

NX Live CD

To install the NX Live CD:

1. Download the QLogic Live ISO image file from the QLogic Web site, www.qlogic.com.
2. Burn the ISO image onto a CD writable media (make sure your system has a CD burner).
3. Insert the NX Live CD into the system that contains the QLogic adapter.
4. Change any BIOS settings to permit the CD to boot before the other devices on the system.
5. Boot the system from the CD.
6. Use the menu options (see "NX Live Menu Options" on page C-3) to show current board information, update the firmware, or reboot the system (remember to remove the NX Live CD if you need to revert back to the operating system (OS) on the hard disk).

Refer to the support page on the on QLogic Web site for more information on downloading the NX Live CD.

NX Live USB

To install the NX Live USB:

1. Download the NX Live USB zip image file from the QLogic Web site, www.qlogic.com.
2. Insert a USB flash device in a USB slot.

3. Format the USB flash device to a FAT file system (if required):
   a. Right-click the **Start** menu, and then click **Explore**.
   b. Right-click the USB flash drive, and then click **Format**.
   c. Format the USB flash drive to a FAT file system.
4. Unzip the NX Live USB file into its own directory.
   a. Right-click the file and click **Open With**, and then click **Compressed (zipped) Folders**.
   b. Copy the two folders `boot` and `slax` onto the USB flash drive.
5. On the **Start** menu, click **Run**. Type **cmd** in the **Open:** box, and then click the **OK** button.
6. Change to the drive letter assigned for the USB flash drive, for example:

   ```
   C:\Documents and Settings>F:
   ```

7. Change the directory to the `boot` folder on the USB flash drive.
8. Execute the `bootinst.bat` file. Press the ENTER key twice to complete the process of making the USB flash drive bootable.
9. Insert the NX Live USB flash drive into the server with the QLogic adapter.
10. Change any BIOS settings to permit the USB flash drive to boot before the other devices on the system.
11. Use the menu options (see NX Live Menu Options) to show current board information, update the firmware, or reboot the system (remember to remove the NX Live USB if you need to revert back to the OS on the hard disk).

NX Live Menu Options

Here is an example of the NX Live menu options:

```
NX Live Firmware Update
Menu Options:
1. Show adapter information
2. Update to latest firmware on adapter
3. Reboot system if firmware has been updated
Enter here:
```

QLogic Adapter Flash Update — Windows Server

This section provides information on how to perform a Flash update in Windows Server 2003 and 2008. Note that the QLogic adapter is shipped with a default Flash version.

Using the Flash Utility

When invoking the `nxflash.exe` utility, use the following syntax:

`nxflash -i "Local Area Connection n" --all`

In this command, the `-i` indicates the interface command and the `"Local Area Connection n"` specifies the adapter being flashed. (The quotation marks are required.)

To determine the adapter number:

1. On the **Start** menu, right-click **My Network Places**.
2. Click **Properties**. The Network Connections window opens.

The Network Connections window lists all of the cards and the type of device to which they are connected.

Along with the interface (`-i` in the `nxflash` command syntax), additional commands are listed in Table C-1.

Table C-1. Flash Utility Commands — Windows Server

Command	Definition	Description
`-i` `--interface`	Interface	This command specifies the interface type (Local Area Connection 1, Local Area Connection 2, etc.).
`--info`	Information	This command prints board information such as board type, chip revision, serial ID, firmware version, BIOS version, MAC address, etc.
`-a` `--all`	Flash update	This command performs a complete update of BIOS and firmware.
`-a <image file>` `--all <image file>`	Flash update	This command performs a complete update of BIOS and firmware using a user-renamed ROM image.
`-r <backup file>` `--restore <backup file>`	Restore	When an update is performed, the previous Flash version is stored to a file in the current working directory. Executing this command restores the specified backup Flash version to the QLogic adapter. Here is an example of a backup file name: `flashbackup_[serial number]_[version]_[date-time]`
`--pxe-on`	PXE	This command enables PXE (default).

Table C-1. Flash Utility Commands — Windows Server (Continued)

Command	Definition	Description
`--pxe-off`	PXE	This command disables PXE.
`--wol-on`	WOL	This command enables wake on LAN.
`--wol-off`	WOL	This command disables wake on LAN (default).
`-d name.xml`	Create XML	This command creates an XML file that contains QLogic adapter/firmware information. For Windows Server, the XML file will be in the current directory.
`-h` `--help`	Help	This command displays the help menu.
`-v` `--version`	Version	This command displays the version information.

Flash Update Procedure

To update the Windows Server 2003 and 2008 operating system (OS) Flash:

1. On the **Start** menu, click **Run**. The Run dialog box opens.
2. Type **cmd** in the **Open:** box, and then click the **OK** button.
3. Go to the `utils` directory in the driver package provided.

   The following binaries must be in the same directory from where the Flash command will be executed:

   `nxflash.exe`
   `[`*`card type`*`]-romimage`

   The release may contain multiple ROM images. The `[`*`card type`*`]` variable in the previous command refers to the exact ROM image. See the Release Notes for more information on the ROM image types.

   Note that the `nxflash` utility and ROM image files must be in the same directory from where the `nxflash` command is executed.
4. Type the following command, where `n` is the number of the port being flashed:

   `nxflash.exe -i "Local Area Connection `*`n`*`" --all` (the quotation marks are required)

   Writing the Flash takes a few minutes. Do not interrupt or reboot the system during this time.

Here is an example of the Windows Server `nxflash --all` output for local area connection 8:

```
C:\netxen\4.0.223\utils>nxflash -i "Local Area Connection 8"
--all
NETXEN Port is Port 0
Verifying flash...Done.
0/9 - Init
*** Currently in flash ***
Board Type        : Quad Gig LP
Firmware Version  : 4.0.222
MAC Address 0     : 00:0E:1E:00:7F:24
MAC Address 1     : 00:0E:1E:00:7F:25
MAC Address 2     : 00:0E:1E:00:7F:26
MAC Address 3     : 00:0E:1E:00:7F:27
Serial Number     : QG88BK0130
NIC binary romimage found in C:\netxen\4.0.223\utils
Rom Image         :
C:\netxen\4.0.223\utils\lp_qg_cut_thru_b1_romimage
1/9 - Extracting Romimage
Firmware version From Board: 4.0.222
Firmware version From Romimage: 4.0.223
WARNING: This operation will take the NIC off line.
Do you wish to upgrade? (Y/N) y
```

5. Reboot the system.
6. Type the following command to verify that the Flash has been updated (`n` is the number of the port being flashed):

   `nxflash.exe -i "Local Area Connection n" --info` (the quotation marks are required)

Here is an example of a Windows Server `nxflash --info` output for local area connection 0:

```
C:\Users\Administrator\Desktop\4.0.223\utils>nxflash.exe -i
"Local Area Connection 0" --info
NETXEN Port is Port 0
Verifying flash...Done.
Board Type                    : 0x24 (Quad Gig LP)
Board Chip Rev                : B1
Serial Id                     : QG87BK0092
Efuse ID                      : 0x4e36343633340f08
Firmware version (on Flash)   : 4.0.228
Active Firmware version       : 4.0.229
Firmware in                   : CUT-THRU mode
Driver version                : 4.0.229
BIOS version                  : 2.0.0
MAC Addr 0                    : 00:0E:1E:00:79:DC
MAC Addr 1                    : 00:0E:1E:00:79:DD
MAC Addr 2                    : 00:0E:1E:00:79:DE
MAC Addr 3                    : 00:0E:1E:00:79:DF
Subsystem ID                  : 0x01244040
PHY Type                      : UNKNOWN PHY
PXE Status                    : Disabled
```

Updating the Flash on Multiple Standalone Adapters

The Flash can be updated on multiple QLogic adapters on the same host using one of the following procedures.

- To perform updates from the same directory tree, type the following commands sequentially after the Flash update has completed. In these commands, `n` represents two different port numbers, for example, `"Local Area Connection 4"` and `"Local Area Connection 5"` (the quotation marks are required).
  - **`nxflash.exe -i "Local Area Connection n" --all`** (first QLogic adapter)
  - **`nxflash.exe -i "Local Area Connection n" --all`** (second QLogic adapter)

- To perform updates simultaneously from two different directory trees, type the following commands from two separate directory trees. In these commands, `n` represents two different port numbers, for example, `"Local Area Connection 4"` and `"Local Area Connection 5"` (the quotation marks are required).
  - **`c:\[version]-a\utils\ nxflash.exe -i "Local Area Connection n" --all`** (first QLogic adapter)
  - **`c:\[version]-b\utils\ nxflash.exe -i "Local Area Connection n" --all`** (second QLogic adapter)

QLogic Adapter Flash Update — Linux

This section provides information on how to perform a Flash update in Linux. Note that the QLogic adapter is shipped with a default Flash version.

Using the Flash Utility

When invoking the `nxflash` utility, use the following syntax:

```
% ./nxflash -i [n] [command]
```

In this command, the `[n]` indicates the QLogic adapter device number (0, 1, etc).

Along with the interface type (`-i` in the `nxflash` command syntax), additional commands (`[command]` in the `nxflash` command syntax) are listed in Table C-2.

Table C-2. Flash Utility Commands — Linux

Command	Definition	Description
`-l` `--list`	List devices	This command shows all QLogic devices installed.
`-i` `--interface`	Interface	This command specifies the interface type (0, 1, 2, etc.).
`--info`	Information	This command prints board information such as the board type, chip revision, serial ID, firmware version, BIOS version, MAC address, etc.
`-a` `--all`	Flash update	This command performs a complete update of the BIOS and firmware. This command is used when the default ROM image is used.

Table C-2. Flash Utility Commands — Linux (Continued)

Command	Definition	Description
`-a <image file>` `--all <image file>`	Flash update	This command performs a complete update of the BIOS and Flash using a user-renamed ROM image. See the Release Notes for a listing of image files and their proper syntax.
`-r <backup file>` `--restore <backup file>`	Restore	When an update is performed, the previous firmware version is stored to a file in the current working directory. Executing this command restores the specified backup Flash version to the QLogic adapter. Here is an example backup file name: `flashbackup_[serial number]_[version]_[date-time]`
`--pxe-on`	PXE	This command enables PXE.
`--pxe-off`	PXE	This command disables PXE (default).
`--wol-on`	WOL	This command enables wake on LAN.
`--wol-off`	WOL	This command disables wake on LAN (default).
`-h` `--help`	Help	This command displays the help menu.
`-d name.xml`	Create XML	This command creates an XML file containing QLogic adapter firmware information in `/tmp`.
`-v` `--version`	Version	This command displays the version information.

Table Notes

The QLogic adapter will be offline during a Flash update.

Flash Update Procedure

To update the Linux OS Flash:

1. Ensure that the steps required for installing the RPM source, creating the binary, and installing the binary to the file system have been performed. If not, follow the instructions in "QLogic Adapter Driver Installation (RPM Format)" on page 6-5 before proceeding. The new driver is now ready to be loaded automatically the next time the system is powered up.
2. Update the Flash.
   a. Type the following command to go to the appropriate directory:

      % cd/opt/netxen

   b. Type the following command to display a list of all the QLogic devices:

      ./nxflash --list

      Note the function number for the QLogic adapter.

   c. Type the following command to start the Flash update; use the function number from the previous step in the `-i` option:

      % ./nxflash -i [*n*] --all

   The Flash update takes a few minutes to complete and *must not be interrupted*. Note that you only need to update one port on each QLogic adapter; updates do not need to be performed on a per-port basis.

   As an example, the `--list` command will display one of the following two devices in an SFP+ installation. For copper -based installations, additional devices will be shown:

   ```
   [0]  NetXen Dual Port SFP+ 10GbE Server Adapter [PCI slot 17 function 0]
   [1]  NetXen Dual Port SFP+ 10GbE Server Adapter [PCI slot 17 function 1]
   ```

3. Get Flash related information. Use the `--info` option to get information about the Flash by typing:

   % ./nxflash -i [*n*] --info

Here is an example of a Linux `nxflash` output:

```
# ./nxflash -i 0 --info
NIC driver will be temporarily unloaded
Closing interfaces: eth2 eth3
PCIE Function Number is 0
Verifying flash...Done.
Board Type          : 0x26 (NetXen NX3031 Dual Port SFP+ 10GbE
Server Adapter)
Board Chip Rev      : B1
Serial Id           : SF8DBK0145
Efuse ID            : 0x0000000000000000
Firmware version(on Flash)  : 4.0.304
BIOS version        : 2.1.0
MAC Addr 0          : 00:0E:1E:00:7C:A4
MAC Addr 1          : 00:0E:1E:00:7C:A5
Subsystem ID        : 0x01264040
PXE Status          : Enabled
WOL Status          : Disabled
Please wait while NetXen drivers are restored...
```

Notes

Glossary

`dbgview.exe`
Debug viewer for Windows Server

`dmesg`
Linux system messages

`Ethtool` utility
Linux Ethernet tool for card settings; See man `ethtool` in Linux

`iperf`
Linux performance tool

iSCSI
Internet small computer system interface.
Protocol that encapsulates data into IP packets to send over Ethernet connections. An alternative to FCIP.

LED
Light emitting diode
Status indicator on a device.

MSI
Message signaled Interrupt

MSI-X
Message signaled interrupt extension
One of two PCI-defined extensions to support message signaled interrupts (MSI), in PCI 2.2 and later and PCI Express. MSIs are an alternative way of generating an interrupt through special messages that allow emulation of a pin assertion or deassertion.
MSI-X (defined in PCI 3.0) allows a device to allocate any number of interrupts between 1 and 2048 and gives each interrupt separate data and address registers. Optional features in MSI (64-bit addressing and interrupt masking) are mandatory with MSI-X.

`netxen_nic.ko`
In-kernel (inbox) GPL driver. It is released into the Linux upstream kernel and included in major Linux distributions.

`nxflash`
Flash utility

`nx_nic`
Commercial GPL driver released by QLogic.

`nxudiag`
QLogic user diagnostic utility

PCIe and PCI Express
A third-generation input/output (I/O) standard that allows enhanced Ethernet network performance beyond that of the older peripheral component interconnect (PCI) and PCI extended (PCI-X) desktop and server slots.

PXE
Preboot execution environment

`romimage`

QLogic firmware image for a QLogic 3000 or 3100 Series Intelligent Ethernet adapter

RPM

Software package file format

RSS

Receive side scaling

SFP+

Small form factor pluggable +

A 1-/10-Gbps transceiver device (smaller than a gigabit interface converter) that plugs into the Ethernet port.

VLAN

Virtual logical area network (LAN)

A group of hosts with a common set of requirements that communicate as if they were attached to the same wire, regardless of their physical location. Although a VLAN has the same attributes as a physical LAN, it allows for end stations to be grouped together even if they are not located on the same LAN segment. VLANs enable network reconfiguration through software, instead of physically relocating devices.

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